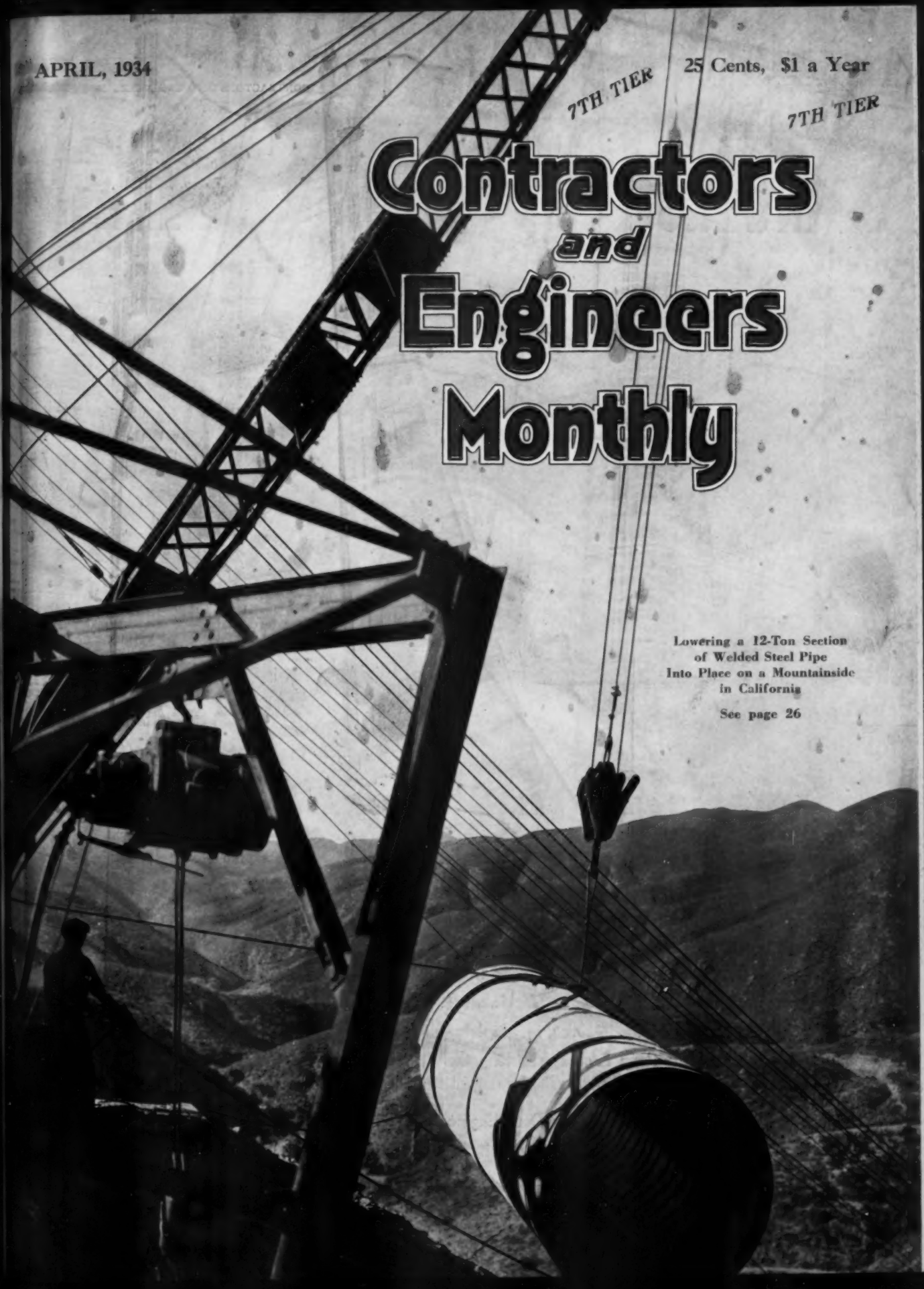
APRIL, 1934

25 Cents, $1 a Year

7TH TIER

7TH TIER

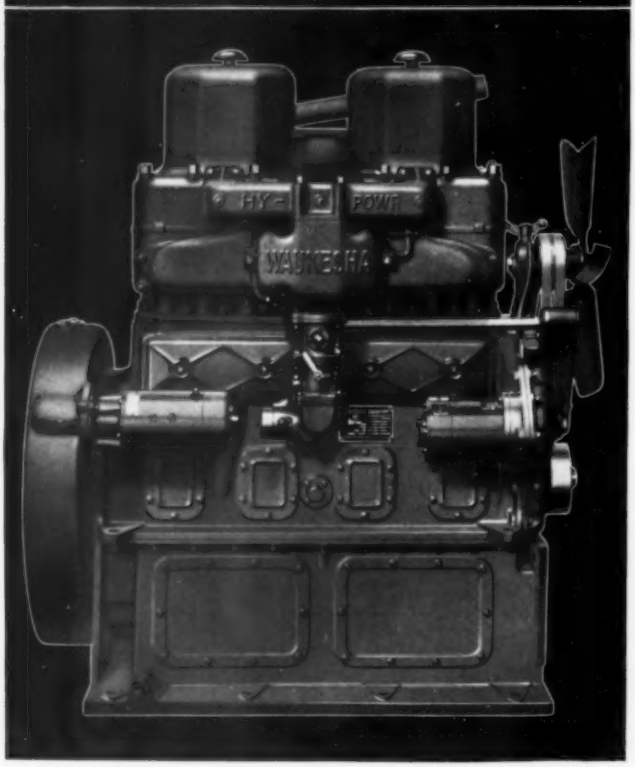
Contractors and Engineers Monthly



Lowering a 12-Ton Section of Welded Steel Pipe Into Place on a Mountainside in California

See page 26

GIVING INGERSOLL-RAND "JACKHAMERS" THE PUNCH



115 hp. FROM WAUKESHA HY-POWR ENGINE BACKS UP THE I. R. COMPRESSOR

Building the new Generals Highway overlooking the San Joaquin valley meant excavating hard granite at 6800 ft. elevation — with an Ingersoll-Rand Compressor furnishing the air for the "Jackhamers" and a 4-cylinder, 115 hp., 929 cu. in. displacement Waukesha Hy-Powr Engine furnishing the power for the compressor.

The Waukesha Hy-Powr Heavy Duty Engine does a job like this *with ease* when an ordinary engine of the same size would be straining its heart out trying to keep up.

This engine has the Waukesha Hy-Powr combustion chamber — an exclusive Waukesha development. That means 20 to 30 per cent *more power.* And a far greater degree of smoothness, flexibility and economy. The life of the engine is longer, too—because valve and valve seats are better cooled, detonation is kept down, dilution is reduced. *Write* for Bulletin 890. *Waukesha Motor Company, Waukesha, Wisconsin.*

WAUKESHA ENGINES

NRA

Moving 132,000 Yards *of* Rock *on the* Old Spanish Trail

By
E. H. Gallenkamp
State Highway Department, Ozona, Texas

L. J. Miles of Fort Worth, Texas, Encountered Unusual Difficulties on 12.98-Mile Texas Project

TEXAS State Highway No. 27 is a part of the old Spanish Trail. During 1932 the State Highway Department awarded a contract to L. J. Miles of Fort Worth, Texas, for grading 12.98 miles of this highway in Crockett County, the work being known as F.A.P. 619-C Emergency Project. Two miles of the job was devoted to climbing out of the Pecos River Valley to the divide above. The climb was made up the east side of a canyon on a 6 per cent grade. The side of the canyon itself is very steep and for this reason the greater part of the road was side-hill construction with a cut on the upper side and a fill on the lower. The typical cross section shows an average section of the road but is not to be taken as an extreme section.

The Drilling Crew Ahead Showing the Cleared Right-of-Way

The 2-mile section, work on which is to be described in this article, was the only part of the contract which was unusual so the tabulation of the main quantities below is divided into hill section and total contract quantities together with the unit price bid.

Item	Hill Quantity	Total Quantity	Unit Price
Solid rock roadway excavation	85,000 cubic yards	132,103 cubic yards	$0.80
Station overhaul	65,000 station yards	115,448 station yards	0.015
¼-mile overhaul	83,400 cubic yards	154,531 cubic yards	0.04
Dry rubble masonry	33,364 cubic yards	33,364 cubic yards	0.80
Mortar rubble masonry	2,367 cubic yards	2,447 cubic yards	5.50
Common roadway excavation	737 cubic yards	41,218 cubic yards	0.14

A Short Section Where the Trucks Pulled Up Alongside the Shovel

DRY RUBBLE MASONRY WALL

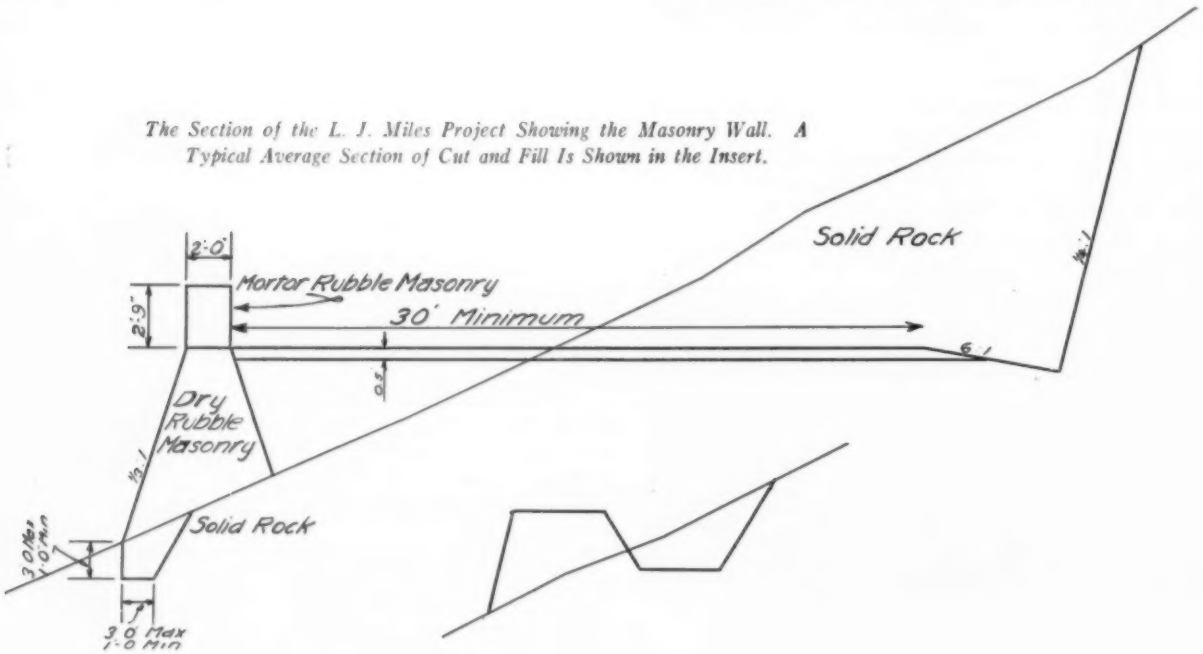
A glance at the table of quantities above shows that the dry rubble masonry wall was an important part of the contract. Since the side slope of the ground averaged almost a 30-degree angle, it would seem that the wall was very important to the success of the job. It was also the deciding factor in the speed with which the job could progress and was carried along slightly in advance of the fill.

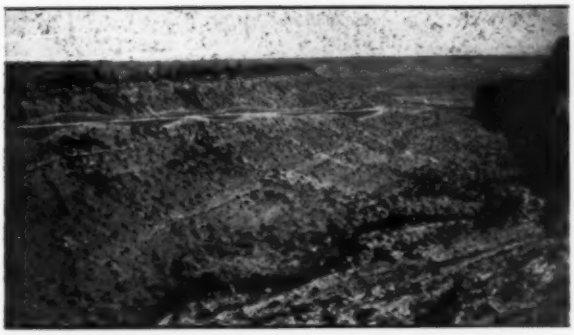
The plans and specifications called for the construction of the wall from material taken out of the roadway excavation. This theoretically was fine, but on actual construction it was found that the material excavated, while being rock, was not in all cases suitable for wall material. This introduced a serious problem. Since the road is on so steep a side-hill, it was impossible to move a shovel from one location to another without first building a special road for it. For example, at Sta. 293, there was a cut of 36 feet, while at Sta. 297, there was a fill of 46 feet. Thus if it were necessary to move equipment around this point, the road must first be built or a road must be made around the head of the wash. The contractor confined his excavating equipment to one 1½-yard P & H power shovel.

The rough profile, together with side-hill construction, explains why the haul was so small compared with the yardage of rock moved. The quantity of rock moved per day or even per month was much below the maximum ordinarily possible with the equipment used, because of the difficulty encountered in locating suitable wall material in each cut.

The dry rubble masonry wall was all hand-placed and the specifications required that it be made of rock not smaller than 1 cubic foot in volume. With the type of rock encountered, it was found that, in some cases when the excavation was shot with sufficient dynamite to lift it and thus make it easy to handle with the shovel, and have a minimum of large rock that had to be reshot, the rock was broken into such small pieces that there was not sufficient suitable material for wall construction. This does not mean that the rock was overshot, since if it had been, there would have been considerable material lost on the steep slope. Rather it was due to the nature of the rock which shattered considerably when shot. The contractor gave consideration to the use of a small derrick or crane which could handle the large rock and place it in the walls. The nature of the ground made this idea impossible as it would have

The Section of the L. J. Miles Project Showing the Masonry Wall. A Typical Average Section of Cut and Fill Is Shown in the Insert.





The General Layout of a Part of the Hill Section, Showing Some of the Difficulties Encountered on the Job Because of the Character of the Country

been too expensive to build runways or roads so that the small crane could be placed in position to do this kind of work. Since the wall in several places was as high as 40 feet, and in one place 80 feet high, it was very important that it be built close to line and slope, since otherwise when the top was reached it would make completion of the roadway difficult. Also since most of the roadway was on curves, there being four 10-degree curves on it in addition to other smaller ones, the wall stakes had to be set with care, and usually they were set as often as every 25 feet.

Mexican labor was used in building the wall, this particular kind of work seeming to go easily with them and they take great pride in their workmanship. The Mexican foreman also took great care that the location of the wall stakes was preserved. He had a book in which he recorded the fill marked on the stake, also the distance out from the center line that the stakes had been set. As this work was done under the emergency labor provision allowing only 30 hours work per week per man, two 5-hour shifts were used each day.

Drilling and Shooting

Most of the drilling was done with an Ingersoll-Rand portable compressor operating four drills. The rock drilling was a real problem as in some cases the rock was stratified with a layer of hard rock alternating with layers of soft rock, decreasing the drilling speed, since in the softer material the drills were slowed up and often hung. In trying to spring the deeper holes, it was found that if the rock was not almost uniform at the bottom of the hole there was little success in springing. The cut varied in depth from nothing to as much as 40 and 50 feet. The holes were drilled to a maximum depth of 20 feet and then, if springing was successful, the holes were loaded with 50 to 60 sticks of 40 per cent Atlas dynamite. It was necessary to use dynamite instead of powder as the excavated rock was to be used in the wall and fill. If powder had been used, considerable material would have been lost down the steep slope. All charges were fired electrically.

Loading and Hauling

Since the nature of the job made it almost impossible to get a shovel onto the job at any place except at the bottom or the top of the hill, the contractor considered starting two shovels, one at each place. The nature of the ground, however, prohibited this as all of the haul had to be down hill with the loaded trucks and it was impossible to move either equipment or materials until a road was built. This same problem of hauling presented itself with regard to culvert construction. The material for the culvert could not be hauled to the site until the road was built. Then a detour road was built for use until the culvert was completed and backfilled. This was a severe handicap since, if the culvert was at the bottom of a 30-foot hill, considerable material had to be left for backfill.

Four-yard International trucks were used for hauling. None of the trucks had cabs since the contractor believes that a cab on a truck of this type presents an added danger both to the driver and the truck when it is loaded with a shovel. This is particularly true when it is considered that most of the time it was necessary for the truck to drive head in directly behind the shovel. Then the shovel loaded over the hood of the truck. Frequently the width of the cut was not sufficient to allow the truck to be placed alongside the shovel for loading and at times the truck could not even be turned for each loading. The driver was required to leave the wheel and get into the clear while the truck was being loaded from the front, the bucket just clearing the driver's seat.

Personnel

Work was started on this contract December 6, 1932, and the shovel reached the top of the 2-mile grade in August, 1933. To do this the shovel climbed 2 miles on a 6 per cent grade. L. J. Miles of Fort Worth, Texas, was contractor for this project and for the State Highway Department, the work was in charge of A. F. Moursund, Division Engineer.

A Section of the Road at an Opening Left for a Culvert

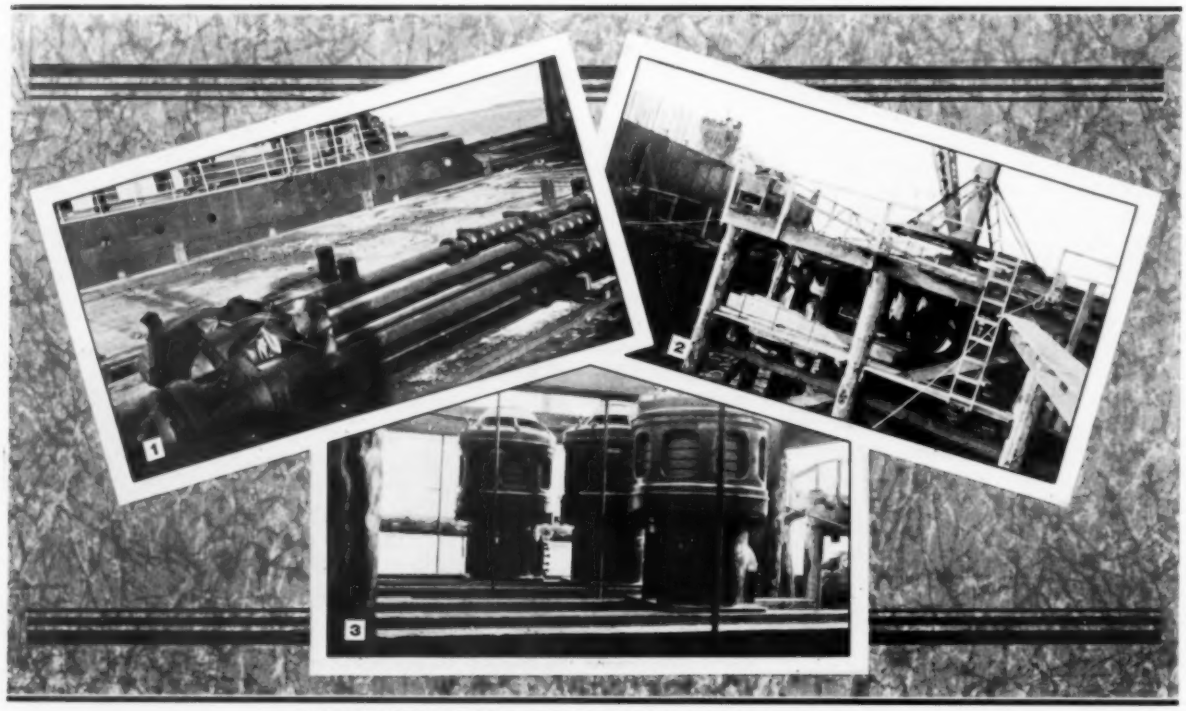
Foundation Operations

on the

San Francisco–Oakland Bridge

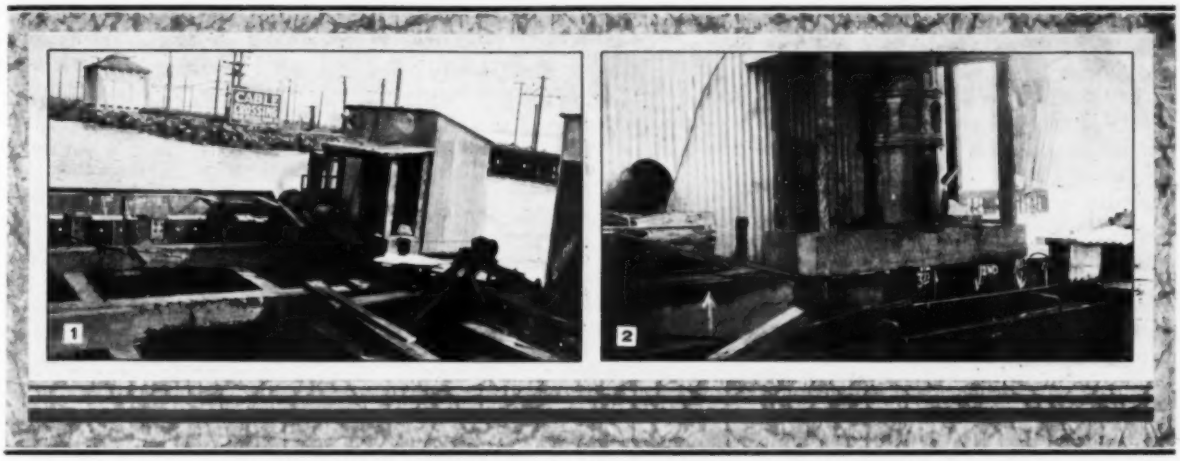
Methods Used by Bridge Builders', Inc. of Oakland, Calif., on Contracts 4 and 4A

THE construction of the San Francisco-Oakland Bay Bridge connecting San Francisco and the East Bay cities is one of the many interesting construction projects now under way on the Pacific Coast. The foundation operations on the eastern section of the bridge will comprise the present article on this work. Contracts No. 4 and No. 4-A involve the construction of the twenty-two piers from Yerba Buena Island to the mainland. In the entire bridge project, there are five distinct types of pier construction, but in so far as only two of these types are used in the eastern section, the discussion will be limited to these.



INSTALLATION OF HIGH PRESSURE PUMPS AT PIER 4

1. Three 1,200-gpm 250-pound pumps on a barge at Parr Terminal at 1 P.M., October 24, 1933. 2. The same pumps installed and operating on the deck at Pier 4, 2 miles from Parr Terminal, at 2.30 P.M., October 24, 1933. 3. A close-up of the pumps showing the method of setting.



PUMP INSTALLATION FOR FOUNDATION WORK IN SHALLOW WATER

1. *View of* 1,200-*gpm,* 125-*pound pressure pump for jetting and cleaning up the bottom of the cofferdam.* 2. *Close-up of the pump and the horizontal I-beam stiffener on the inner side of the steel sheet piling. Note the small amount of cross bracing in the first illustration.*

COFFERDAM CONSTRUCTION IN SHALLOW WATER

In water from 10 to 30 feet in depth a sheet piling cofferdam is erected, from the inside of which the mud is excavated to plan elevation. Piling is then driven on 4-foot centers to proper bearing with the top of the piling 35 feet below mean low water and 10 feet above the point of excavation. Concrete is poured through tremie pipes around the piling to form the base of the pier.

Two matters of particular interest in this construction are the methods of building the cofferdams and the method of driving the piling. At the time the sheet piling is driven, a 36-inch I-beam is driven with each fourth sheet pile and attached to the outside of the piling. When all of the piling is in its final position, a horizontal I-beam is attached to the inner side of the piling at the top and the combination of these two heavy beams gives rigidity to the cofferdams with a minimum of cross bracing, leaving the inner area almost entirely open to give the buckets ample free space to speed up excavation.

An American steam pile driver is used for driving the piles beneath the water and is so designed that it can follow the piles to the bottom of the excavation. In order to drive successfully with the hammer submerged, it is necessary to hold the water from the internal working parts of the hammer by use of compressed air.

In the construction of the piers of this type, Byron Jackson pumps are used in three different ways. After the clamshell bucket has excavated down to the harder formation from which piling is to be driven, there is a considerable portion of clay in the corners and beneath the cross bracing, which the bucket cannot reach. In order to loosen up this formation and get it into position where the bucket can handle it, a 1,200-gpm 125-pound vertical pump is installed and a hose line with a jetting nozzle is carried beneath the water where it can be directed against the clay to be moved, either by a diver or by proper attachments from the surface. This same pump may be called on to do some jetting during pile driving if later conditions warrant.

When the concrete is to be poured, the cofferdams are unwatered and at that time contractors' vertical dewatering pumps will be installed with the motors resting across the top of the cofferdam, and of such length as to place the pumping element at the bottom of the cofferdam. In this way it will be possible to unwater the dam completely and to maintain it in a relatively dry condition without touching the pumps. The employment of the submerged pump operating at the bottom of the cofferdam is of particular advantage in this type of work. In some of these dams it will be necessary to unwater 30 to 35 feet and a horizontal pump could only be used by having several different set-ups with consequent delay in moving the pump. Also a vertical pump is primed at all times because it is submerged and there is consequently no tendency to draw air.

WORK ON THE DEEPER COFFERDAM

In the deeper water it is out of the question to use a cofferdam which is later to be unwatered. Where the piers have to be built under these conditions, the method is to build up in the dry dock a steel caisson with a cutting edge on the bottom. In order to assist the cutting edge in settling into the mud, it is connected at rather close intervals with jetting nozzles to which water is pumped from the surface. A false bottom is constructed in the caisson and it is then floated into position between four moving columns, one located at each corner. By pouring additional concrete in the caisson, as well as building up the walls, the caisson is weighted down until it touches soft bottom. During this process the caisson has sufficient freeboard to keep the ordinary wash from the waves from sinking it. When the caisson is landed, it settles a certain distance into the mud due to its own weight. Then the false bottom is removed by pulling out a keyblock and the centers of the several compartments of the caisson become dredging wells through which the material on the bottom is removed to aid the settling of the caisson. As it continues to settle, additional concrete is poured on the walls to maintain the freeboard, until it reaches its ultimate position. One of these caissons must go to a depth of 218 feet from the surface of the water. At the present

time, Pier 5, the most advanced in construction, is rapidly approaching its maximum depth of 170 feet.

During the sinking operation of the caisson, while the false bottom is still in place, it is necessary to take care of any leakage, or in case of a heavy storm where waves might wash over the sides, it is necessary to pump it out. This is done by vertical dewatering pumps approximately 15 feet long, so designed that they may rest upon the strainer. This permits the lowering of the water in the interior of the caisson, in the section which is later to become the dredging well. In case water should enter for a brief period at a rate greater than the pump can move it, the fact that the motor is mounted some 15 feet above the pump permits the unit to continue in operation without damage, even should the water gain as much as 15 feet.

After the false bottom is pulled and excavation withing the dredging well begins, there is a tendency, because of the amount of material removed, for the water level to become lower in the dredging well than outside. If this condition is permitted to continue, the differential pressure will tend to squeeze in material from the outside into the caisson with the result that the caisson could not be sunk readily. In order to maintain the level within the dredging well at least as high as outside, water is pumped from the outside to the dredging well. Obviously, if this pumping were continuous, from the standpoint of efficiency, a low head pump would be employed, but insofar as there is only a nominal amount of water to be removed, the pressure jetting pumps on the dock are used. While this is inefficient, it serves to illustrate the flexibility of the equipment and the planning to reduce the investment in equipment.

High-Pressure Pumping

It is anticipated that before these caissons are landed in their final position, formations will be encountered which will be so hard that, even with the excavation from the dredging wells, the weight of the caisson alone will not be sufficient to sink it. When this does occur, the jetting pumps will be used. The jets along the cutting edges are connected to Byron Jackson vertical high-pressure pumps mounted on the docks adjacent to the caisson. These jetting pumps are capable of delivering 1,200 gpm at 250 pounds and are each operated by a 250-hp motor. Two of the photographs show the speed with which these pumps can be put into service. One of the photographs shows three pumps on the barge at Parr Terminal at 1 P. M. and the other two photographs show one unit installed and operating on the docks of Pier 4 just off the end of the Key Route Mole at 2:30 P. M. the same day, after having been moved a distance of 2 miles from Parr Terminal. The installation required only lifting from the barge and placing in position, making the electrical connections and a flange connection with a hose on the discharge. No suction pipe, check or foot valve was necessary. The method of installing the pump is rather interesting. Because of limitations in dock space, the pumps are mounted on beams suspended from the dock but at such an elevation that after they were placed in position, the docks could be floored over, leaving the deck clear. The pumps are controlled from a push button station located at a distance from the pump and attention is required only for starting, stopping and occasional lubrication.

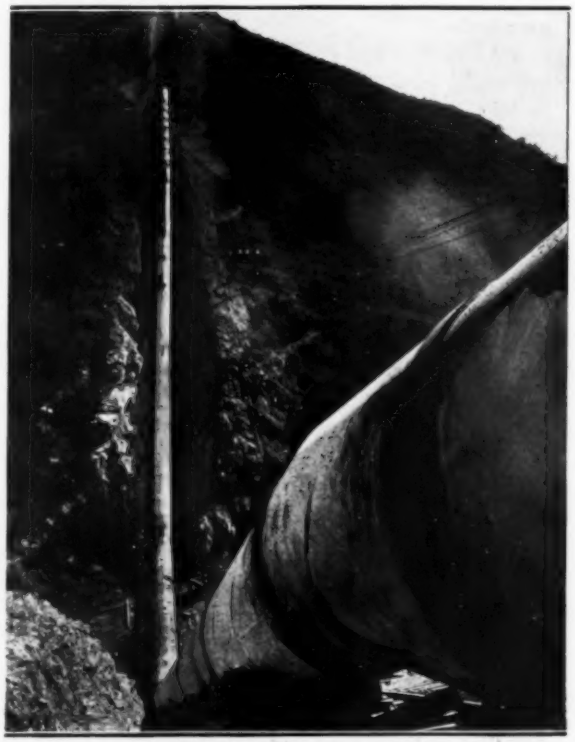
The operations on contracts 4 and 4-A are in charge of E. H. Connor, Managing Engineer for Bridge Builders', Inc., with C. B. Jansen, General Superintendent, supervising field operations.

The West's Largest Pipe Line

A 4½-MILE arc welded pipe line, a part of the gigantic system of the Department of Water and Power of the City of Los Angeles, will soon join the Bouquet Canyon Reservoir with the Owens Valley Aqueduct, near Saugus, Calif. The new Bouquet Canyon Dam replaces the St. Francis Dam which was destroyed several years ago. Water will be carried from the reservoir back of the dam to a power house surge chamber where the Owens Aqueduct also empties.

The pipe line under construction is said to be the largest in the West. It varies in diameter from 7 feet 10 inches to 6 feet 8 inches, depending upon the pressure. The 80-inch pipe is used where the pressure is the greatest, at which point the pipe is 1 1/16 inches thick. At the bottom of one of the canyons crossed, the pressure is 400 pounds per square inch. Fabrication of the pipe is handled by the Western Steel & Pipe Co. The laying of the line and field welding are done by the Los Angeles Department of Water and Power, using Lincoln Fleetweld electrodes. For both the pipe fabrication and the field welding, the shielded arc process is used. It requires 450 pounds of electrode to weld each joint on the job, 32 man-hours to weld the outside of one joint and 24 hours for the inside. The welding is being carried on 24 hours a day.

Sections of pipe, each weighing approximately 12 tons, are hauled to the job by trucks where the Department of Water and Power has a sand-blasting and painting plant which cleans and paints the pipe before it is placed. When painted, it is hauled on trucks to the top of the mountains where Link-Belt crawler cranes unload and place the sections in a specially designed carrier called a "straddle bug," which is a structural steel framework that runs on rails and carries the pipe suspended from air hoists, by means of which the pipe is lowered down the canyon side. In some places the pipe is lowered over 1,000 feet.



A 7-Foot Arc-Welded Pipe Line Descending One Mountain Side and Climbing Another

The Lubrication *of* Tractors

The Fourth of a Series of Articles on an Important Phase of the Maintenance of Construction Equipment

NO piece of construction equipment operated by contractors is deserving of more serious consideration of the proper and efficient lubrication than tractors. The duty which they perform is most important and they operate under the most adverse conditions, as they generally carry peak loads and have to contend with mud, dust, rocks, sand, water, etc. All bearings are under great stress when in operation and usually involve high temperatures, especially during the warmer seasons of the year. It is impracticable to construct these bearings with a sufficiently close fit to exclude water, dirt and other deleterious and abrasive substances, so it becomes necessary for the lubricant used to perform this function.

No unit in the contractor's service requires more specialized lubrication, to conserve bearings and obviate excessive replacement and repair expense, not to mention the loss of service when time is an important factor. The tractor manufacturer has contributed to the protection of the operator of his machines by using the best materials obtainable in bearing construction, that they may function as efficiently as possible. That his purpose may not be defeated, he stresses in his instruction books the importance of using the best lubricants obtainable for their preservation. Many operators believe that a lubricant which obtains for him satisfactory results on the majority of his equipment will be equally as satisfactory on all units. This is seldom the case, as ordinary lubricants in the lower-priced class are not adapted for heavy duty, such as the tractor performs.

The inferior grades of lubricants will not withstand the high temperatures to which tractor bearings are subjected. They break down quickly under pressure and their value as a lubricant is soon destroyed. Seldom are they impervious to water, and they are readily washed away, leaving the bearing surfaces unprotected against corrosion and the admission of abrasives, which cause rapid deterioration. Ball and roller types of bearings are quite generally employed by the manufacturer to reduce friction to the minimum. These balls and rollers have highly finished and polished surfaces, which

An Outdoor Lubrication Station on a Levee Project at Lake Village, Ark., Where Tractors and Crawler Wagons Were Greased Twice a Day

are susceptible to the acids which are present in greater or lesser quantities in the so-called cheaper lubricants. These acids quickly attack and pit the bearings, rendering them useless and necessitating an early replacement at a heavy expense.

The better grades of lubricants are manufactured with unusual care and are free from injurious ingredients of any description. The materials used in their production usually are of the highest type and capable of withstanding excessive pressure without destroying their structure and sustaining properties. They are water repellent and, when properly selected, are of a consistency which permits their gradual working to the outer ends of the bearings, forming a seal which protects them against incursion of devastating substances. The difference in first costs of the inferior and better grades of lubricants is of small consequence, considering the volume consumed during a given period. This is invariably offset by the longer service obtained from the superior product, as a much smaller quantity is actually consumed to obtain desired results. Furthermore, the protection against frequent replacements and repairs is the most practical and economical insurance.

The Equipment Manufacturer's Attitude Toward Lubrication

The importance of properly selected lubricants cannot be over-stressed from the buyer's standpoint. Ser-

vice and efficiency are paramount in mechanical operation and with these obtained, the economic condition will care for itself. Equipment manufacturers are constantly advocating the use of the better grades of lubricants for their products, as they realize the importance of this question. We take the liberty of quoting an extract from a letter recently received from one of the most prominent tractor manufacturers, which substantiates the foregoing statements:

"This leads up to a general thought which we believe covers the situation with respect to tractor lubrication, as well as applying very directly to the lubrication of any piece of machinery. That is, we feel particular emphasis should be laid to specifying or recommending that the operator of the equipment should not use general lubrication but instead should select the lubricants that are specially designed for the lubrication of each type of equipment and built to withstand the strains present when that equipment is in field operation."

Another manufacturer states: "It is general in the minds of most operators that the regular run of greases which are built for grease cup or pressure gun lubrication, as applied to chassis of automobiles, are equally as applicable for use in tractors, which is erroneous. They are not built to withstand the dirt conditions and the heat as found in tractor operation and many of them are useless for this purpose."

CLEAN ALL PARTS BEFORE LUBRICATING

Due to the conditions under which tractors frequently operate, the bearings, grease cups, pressure fittings and filler plugs are oftimes completely obscured with thick layers of mud and gumbo, as shown in the illustrations. Oilers should thoroughly clean all such bearings and fittings before applying fresh lubricants, to preclude the possibility of any dirt, grit or other foreign substance entering the bearings or housings.

TRACK ROLLERS AND BEARINGS

Invariably the parts of the tractor which give the most trouble and have to be replaced most frequently are the track rollers and the bearings which support the tractor, such as the idler and wheel bearings. These tractor rollers, which carry the weight of the tractor, are subject to all the stresses of operation. Since tractors operate in dirt, sand and water, it is vitally im-

CRAWLER TRACTORS AS THEY LEAVE THE SHOP AND UNDER VARIOUS ADVERSE OPERATING CONDITIONS

1. A Model 80 Cletrac, showing the condition in which a tractor leaves the factory. 2. An Allis-Chalmers tractor with bulldozer operating in muck. 3. An A-C Model L traveling at high speed through dusty soil conditions. 4. A McCormick-Deering TracTracTor pulling a grader through sticky soil.

portant that lubricants which are least affected by such severe conditions be used in those parts. A well-made semi-solid lubricant of the better grades, having heat and water-resisting properties, is best adapted for these purposes. Applications should be made about every 10 hours of operation to insure a substantial and constant seal being maintained at all times.

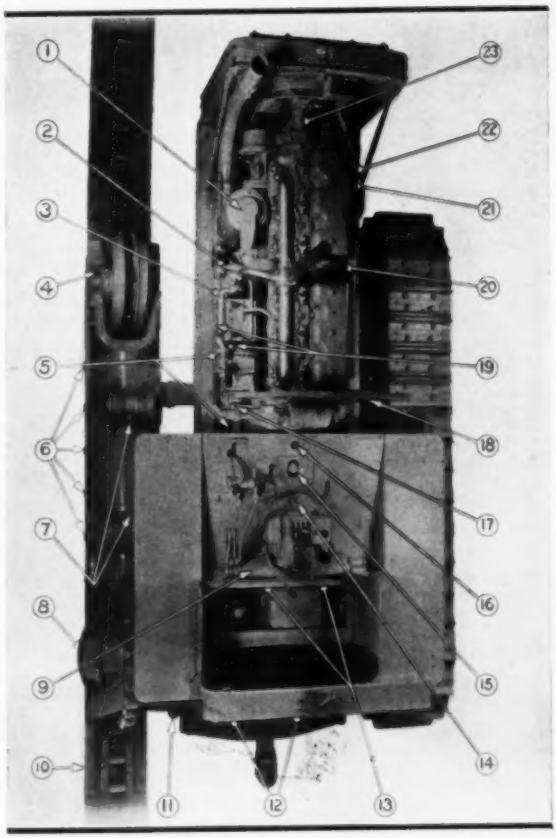
Transmission and Final Drive Gears

The next in importance are the transmission and final drive gears. They absorb the undivided driving load of the tractor and the pressure at the points of contact is excessive. There is a divergence of opinion among engineers as to the correct type of lubricant to be used for this purpose. It is generally agreed that, regardless of the type of gears employed, the lubricant should be sufficiently fluid to permit its flowing freely at all temperatures, and to possess sufficient film strength to withstand the unusual pressure to which the gears are subjected. There are several types of lubricants which may be used successfully and obtain for the operator very satisfactory results, providing the oil used in their construction is of proper viscosity and has a sufficiently high flash and fire test to withstand the heat conditions without breaking down or thinning out. Certain types of oils are susceptible to the absorbtion of an unusual amount of air which tends towards excessive foaming and expansion of the lubricant, which is detrimental to its proper functioning. The expansion causes the gear case to become too full and invariably results in the overflow of the lubricant into the clutch, causing slippage and thereby burning out the clutch facings.

Specialty Lubricants

The "extreme pressure" lubricants and those which are commonly known as lead-base lubricants are rapidly coming into favor for the lubrication of encased gears. The former are manufactured with a sulphur base which increases their pressure-resisting properties materially and also acts as a coolant. Lead-base lubricants have many adherents who claim they create a stronger and more stable lubricating film, combined with substantial friction-reducing properties. This type of lubricant has been very successfully used in industrial plants for many years for the lubrication of large sets of reduction gears. These lubricants are generally classified as "specialties" by the trade, though their value has been recognized in the automotive field for some time.

The better grades of steam cylinder oils have been quite generally recommended by tractor manufacturers for gear lubrication and have been proved generally satisfactory. In fact, several lubricant manufacturers use this type of oil in manufacturing the two "specialties" mentioned above, while others manufacture a very desirable gear lubricant with steam cylinder oils, combined with finely ground asbestos. It is maintained that the asbestos materially enhances the cushioning properties of the oil and reduces the wear on the face of the gears. The lubrication of encased gears is of sufficient importance to the operator to warrant his safeguarding his interests by selecting only those lubricants as are manufactured by well-known, reputable concerns and to follow as far as possible the recommendations of the tractor manufacturers, as given in their instruction books.



Lubrication Chart for a Caterpillar Seventy-Five Tractor

Lubrication Instructions for the Seventy-Five Tractor Illustrated

Chart Ref. No.	Name	Points of Lubrication	Kind of Lubricant	Attention Required
1	Air Cleaner	1	Crankcase Oil	At intervals varying from every 5 hours to every 60 hours, depending on the amount of dust in the air, wash cup and refill to circular mark. In summer use S.A.E 30 crankcase lubricating oil. In winter use S.A.E. 20. Wash filter section every 300 hours. See topic, Care of Air Cleaner.
2	Starting Engine Governor Housing	1	Crankcase Oil	Lubricate every 10 hours through oil cup in housing.
3	Starting Engine Crank Sprocket Shaft Bearing	1	Semi-fluid Lubricant	Fill bearing every 10 hours.
4	Front Idler	2	Transmission Lubricant	Fill bearings every 10 hours.
5	Bendix Shaft Bearing	2	Semi-fluid Lubricant	Fill bearings every 60 hours.
6	Track Roller	12	Transmission Lubricant	Fill bearings every 10 hours.
7	Track Carrier Roller	4	Transmission Lubricant	Fill bearings every 10 hours
8	Track Roller Frame Outer Bearing	2	Semi-fluid Lubricant	Fill bearings every 10 hours.
9	Steering Clutch Control Lever Sleeve and Shaft	1	Sem-fluid Lubricant	Fill bearing every 60 hours.
9	Brake Pedal Shafts, Fly-Wheel Clutch Control Lever Shaft, and Steering Clutch Control Lever Shaft Inner Bearing			Bushings are graphited and do not require lubrication.

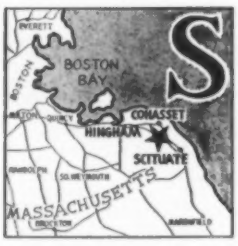
10	Track			Do not lubricate.
11	Final Drive Case	2	Transmission Lubricant	Check oil level every 10 hours. Fill until oil level is even with top of filler elbow. Drain, wash and refill with fresh oil every 900 nours. See topic, Washing Final Drive Cases.
12	Track Roller Frame Inner Bearing	2	Semi-fluid Lubricant	Fill bearings every 10 nours.
13	Steering Clutch Release Bearing	2	Crankcase Oil	Oil every 10 hours.
14	Transmission Case	1	Transmission Lubricant	Check oil level every 10 hours. Fill until oil is even with oil level plug hole in right hand side of transmission case. Oil in bevel gear compartment adjusts itself to level in speed change gear compartment. Drain, wash and refill with fresh oil every 900 hours.
15	Flywheel Clutch Shift Collar	1	Transmission Lubricant	Fill oil cup every 10 hours.
16	Flywheel Clutch Driving Plate Bearing	1	Semi-fluid Lubricant	Fill bearing every 60 hours. Turn flywneel with crank until Zerk fitting in driving plate can be seen through hole in floor plate. Grease passage is designed to receive a definite amount of lubricant. A plunger in the pas age automatically limits the amount of grease that can be put in. When resistance is encountered during pumping operation of grease gun, it indicates bearing is full.
17	Starting Engine Transmission Shaft Bearing	1	Semi-fluid Lubricant	Fill bearing every 60 nours.
18	Oil Pressure Gauge			If pressure fails to show, stop engine immediately and determine cause. Operating pressure when engine is warm is approximately 30 pounds.
19	Starting Engine Crankcase and Breather	1	Crankcase Oil	Keep oil level to "Full" mark on oil level gauge, check every 10 hours. Use the next lower S.A.E. viscosity number of crankcase oil than is used in diesel crankcase. Drain and refill with fresh oil at same time this is done to diesel crankcase. Wash breather when changing oil.
20	Fuel Pump Housing	1	Crankcase Oil	Fill until oil level is even with top of filler elbow. Drain and refill with fresh oil every 300 hours. Wash as outlined under the topic, Washing Fuel Pump Housing.
21	Crankcase	1	Crankcase Oil	Keep oil level to "Full" mark on oil level gauge. Check every 10 hours Drain while hot and refill every 30 nours, when working under dusty conditions; otherwise every 60 nours. See topic, Washing Crankcase. While crankcase is draining, wash crankcase oil filters. See topic, Washing Crankcase Oil Filters. After crankcase is filled start eagine and run it for about two minutes to allow oil to be pumped into filters. Tnen stop engine, check oil level, and if necessary refill to "Full" mark on gauge.
22	Breather	1	Crankcase Oil	In cold or damp weather remove drain plug in base of breather each time the oil in the crankcase is changed. Wash filter element every 300 nours. To wash, remove from base and shake in gasoline or kerosene. After washing pour about ¼ pint of oil through filter element.
23	Front Engine Support	1	Semi-fluid Lubricant	Fill bearing every 60 hours.
	Miscellaneous		Crankcase Oil	Oil every 60 hours. Flywheel clutch hub, metal links and pins and all joints in control system not equipped with fittings, except the places where graphited bronze bushings are used.

There are so many makes of tractors, both of the crawler and the standard four-wheel types, that it is impracticable for the purpose of this article to incorporate the many points of lubrication of each type and offer definite recommendations for all, but the lubrication chart reproduced above and the recommendations accompanying it, comprising 41 points, gives an excellent picture of the situation.

In this article we make no mention of the lubrication of the internal combustion engine as this subject was covered in the preceding article.

Penetration Surfacing in Southern Massachusetts

Features of 5.8-Mile Cut-Off on Route 3A Between Cohasset and Scituate, Mass.



STATE ROUTE 3, running through Quincy, Weymouth, Kingston and Plymouth, Mass., is the most direct route between the Hub and the Cape Cod Playground of Massachusetts. East of this route, leaving the main highway at Quincy, is Route 3A running to the beach resort at Nantasket and the fashionable shore resorts of Cohasset, Scituate, Marshfield and Duxbury. Since a considerable portion of this route is through the main streets of these towns, the State Department of Public Works of Massachusetts laid out a 5.8-mile cut-off between Hingham, Cohasset and Scituate which will greatly improve traffic conditions through that section. The contract was awarded to C. M. Callahan, Inc., of West Roxbury, Mass. Clearing was started on January 19, 1933, and grading on February 5, 1933. The entire project, including the heavy grading and penetration surfacing, was completed by December 15, 1933, the final work being done by B. Perini & Sons of Framingham, Mass. The contractors operating under the 30-hour Federal regulations worked 10 hours daily, six days a week with the crews changing on Thursday, working the three last weekdays of one week and the first three weekdays of the next.

QUANTITIES AND PRICES

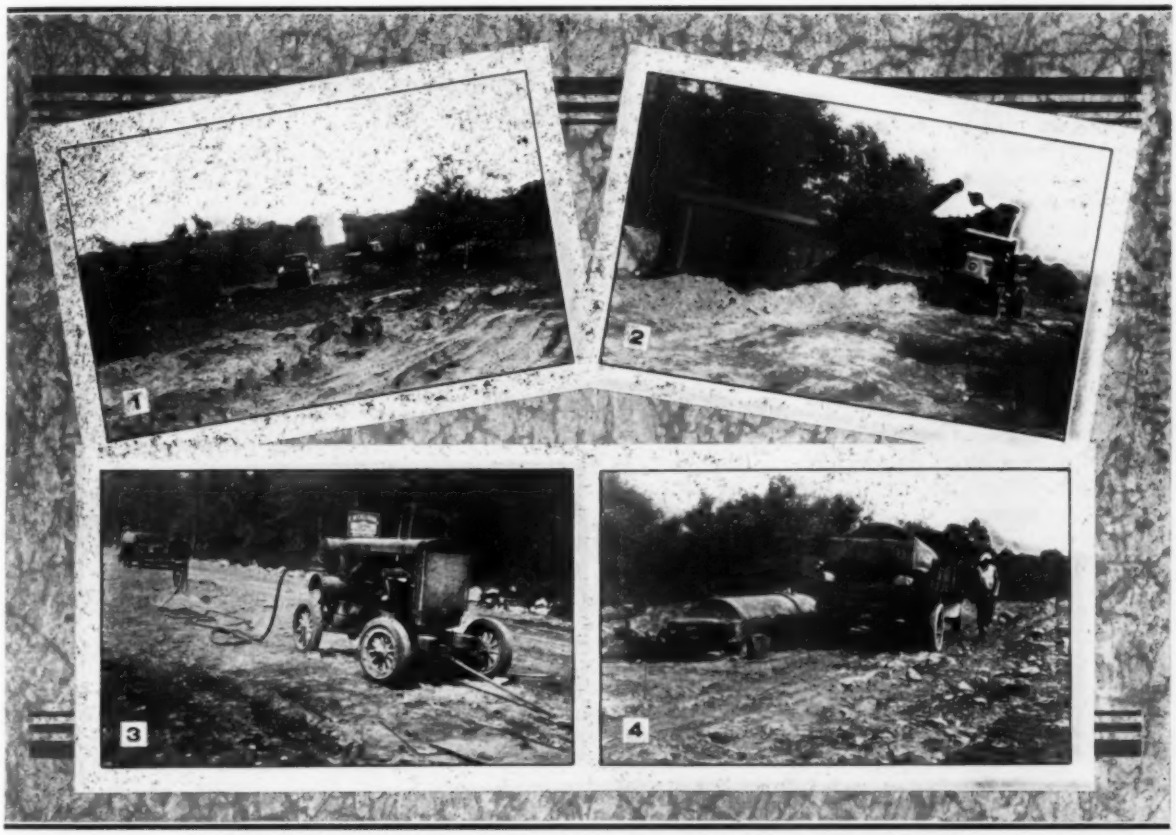
Item	Quantity	Unit Price
Earth excavation	73,000 cubic yards	.20
Bridge excavation	160 cubic yards	1.00
Ledge excavation	11,500 cubic yards	1.00
Borrow excavation	76,800 cubic yards	.20
Concrete masonry 1:2½:6	101 cubic yards	12.00
Concrete masonry 1:2:4	308 cubic yards	15.00
Broken stone	45,370 tons	1.50
Bituminous material	297,000 gallons	.08
12-inch Vitrified clay or concrete sewer pipe	626 linear feet	.40
12-inch Reinforced concrete pipe	4,424 linear feet	.75
15-inch Reinforced concrete pipe	36 linear feet	1.00
18-inch Reinforced concrete pipe	1,406 linear feet	1.25
24-inch Reinforced concrete pipe	320 linear feet	1.75
36-inch Reinforced concrete pipe	64 linear feet	5.00
Gravel borrow	80,500 cubic yards	.30
Sand borrow	3,380 cubic yards	1.00
Fine grading	204,500 square yards	.01
Trench excavation	3,500 feet	.50
Clearing and grubbing	34 acres	50.00
Peat excavation	18,800 cubic yards	.25
Cast iron culvert pipe	110 linear feet	2.00

excavated area backfilled with ordinary borrow by dumping it to form a wedge through the middle of the excavation, thus pushing the muck toward the two sides and establishing a firm backfill.

On the south end of the project where the excavation was heavier, there were two Bucyrus-Erie ⅞-yard steam shovels. These shovels loaded to two to five trucks per shovel, the trucks all being hired and equipped with pneumatic tires. The deepest excavation was a through cut 10 feet deep plus 1½ feet of subgrade excavation, 2,200 feet long.

On rock excavation, of which there was 11,500 cubic yards on the contract, two Ingersoll-Rand compressors were used, one operating two jack hammers and the other three jack hammers. The larger compressor was also used to operate two Simplex tripod drills running holes from 8 to 14 feet deep. For blasting 4,500 pounds of Hercules Gelamite was used.

The contractor used two to four men on each dump and had two Allis-Chalmers-35 crawler tractors with bulldozers handling the heavier rock on the fills. The rough grade was dressed with a Wehr power grader which was used also in trimming the two 6-inch courses of gravel subbase, a standard practice with all penetration and concrete paving in Massachusetts. This contract also called for 5-foot gravel shoulders on each side of the paved road.



HEAVY EXCAVATION ON THE COHASSET-SCITUATE, MASS., CUT-OFF

1. *Stripping top-soil across a flat and showing the site of the maximum cut in the center background.* 2. *Heavy grading with one of the steam shovels.* 3. *Drilling a rock outcrop.* 4. *Supplying water for the steam shovels to one of the reserve tanks.*

GRADING OPERATIONS

On this 5.8-mile cut-off the paved surface was uniformly 30 feet wide, except for one section over a hill where the roadway was widened to 40 feet in accordance with Massachusetts practice. On the north section of this contract which ran approximately north and south, the grading was light but there were eight swamp sections varying from 450 feet down to 250 feet in length. On the worst of these the water was 11 feet deep while on the others it ran from 3 feet down to 1½ feet. Peat or muck excavation was handled with a P & H diesel crane with a 60-foot boom and a 1¼-yard Owen clamshell bucket. The peat was cast to the side and the

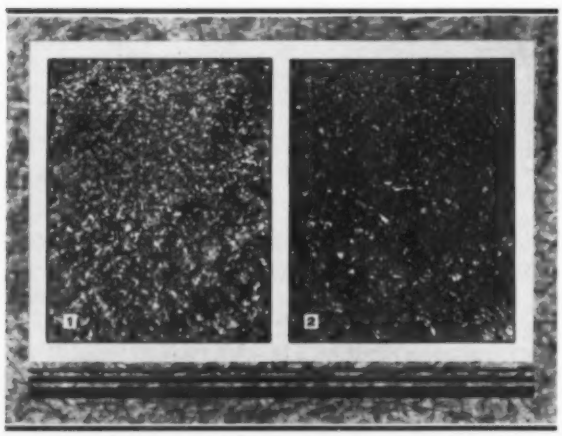
THE BASE AND PENETRATION SURFACE COURSES

The 4½-inch crushed stone base course composed of Massachusetts specification No. 1 and at least 40 per cent of No. 2 stone was supplied by the Old Colony Crushed Stone Co. of Quincy, Mass., which hauled the stone 12 miles dead haul from its quarry. No. 1 stone is from 2½ to 1¾-inch and No. 2 stone from 1¾ to ¾-inch. This base course was rolled with a Buffalo-Springfield 12-ton steam roller and a 14-ton gas roller of the same make. The stone was spread in 10-foot lanes, from two Burch and one Good Roads spreader boxes, which were pulled by the producer's trucks. The labor organization for spreading consisted of one man who hitched the boxes to the trucks and seven men raking and forking.

The base course was bound with washed sand supplied by the Boston Sand & Gravel Co. from its Greenbush plant, located practically at the south end of the job. The sand was stockpiled along the shoulders and hand cast across the road by four to eight men. These men broomed the sand into the openings between the stones and it was then rolled by the two power rollers to a firm compact base.

The 2½-inch top course of 1¾ to 2½-inch stone was spread with the boxes and rolled. The stone crew carefully hand trimmed the surface during rolling to secure a uniform surface texture. This surface was then penetrated with Socony Binder C delivered by Standard Oil Co. of New York tank trucks, and applied at 350 degrees F., at the rate of 2¼ gallons per square yard. This bituminous material has an 85-100 penetration. Immediately following penetration, the stone crew hand cast ¾-inch stone from stockpiles along the shoulders and broomed the lean covering of stone to secure a uniform application during rolling. The stone was applied lean so as not to completely fill the top. A seal coat of ½-gallon per square yard of Binder C was applied a few days later and immediately covered with ½-inch stone and rolled.

In order to supply the two steam shovels with water, the contractor was forced to haul in water by means of an old tank mounted on a Mack truck. Duplicates of the truck tank were spotted near the shovels and kept filled as reserve supplies. For normal operation the tank trucks would drive close to a supply tank and a small Fairbanks-Morse Typhoon pump would pump direct from the truck tank to the shovel after it had filled the auxiliary tank on the road.



SURFACE TEXTURE OF THE PENETRATION MACADAM

1. The top course of 1¾ to 2½-inch stone penetrated and filled with a lean covering of hand-cast ¾-inch stone. 2. The seal coat before the application of the ½-inch stone.

EQUIPMENT USED BY B. PERINI & SONS

After B. Perini & Sons took over the work in August, they used four Lorain 75-B shovels on gravel, excavation and borrow and two Lorain 55-A shovels on excavation of subgrade; two Caterpillar diesel Fifties, a Caterpillar Thirty and an Allis-Chalmers 30 tractor with bulldozers on the dumps; three Wehr graders on the subgrade and gravel; six Buffalo-Springfield gas rollers on the subgrade, gravel and stone; eight 9-yard 6-wheel Mack trucks and seventeen 5-yard Mack and Sterling trucks; and two Universal cranes with ¾-yard clamshells mounted on Mack chassis for clean-up work along the shoulders.

PERSONNEL

This 5.8-mile contract was awarded to C. M. Callahan, Inc., of West Roxbury, Boston, Mass., for whom W. E. L. Duval was Superintendent. From the middle of August, the work was carried on by B. Perini & Sons of Framingham, Mass., for whom Raymond H. McAuley was Superintendent. For the State Department of Public Works, James J. Mahoney was Resident Engineer.

Nearly a Million Highway Workers—An All-Time Record

ALMOST one million men were employed in highway and allied work at the beginning of the year 1934. This included men engaged in highway building on State and Federal roads only and those working in related industries. These figures collected by the U. S. Bureau of Public Roads, which is administrating the $400,000,000 appropriation for public works highways, show also that the employment of men on Federal and State highways has reached an all-time high for the winter season. A grand total of 956,000 men were employed at the beginning of the year as follows: employed at the sites of the highways, 362,000; industrial labor in dependent industries such as stone quarries, gravel pits, etc., 543,000; administrative and supervisory labor, 51,000. Assuming a family of only three, the persons supported by these laborers in highway activities number 2,868,000. The number of names of men appearing on the payrolls is materially larger than the figures given due to labor turnover. This record peak of winter employment exceeds the highway employment figures for the summer months of last year.

Highway employment at the beginning of the year, divided by classes of roads, for men engaged on State and Federal work at the sites of the highways was as follows:

Public works highway construction supervised by the U. S. Bureau of Public Roads	134,862
Federal relief highway construction projects supervised by the U. S. Bureau of Public Roads	36,366
Regular Federal-Aid highway construction supervised by the U. S. Bureau of Public Roads	1,723
Forest, park and public land road construction supervised by the U. S. Bureau of Public Roads	1,407
State highway construction with state funds	46,810
State and federal highway maintenance	140,832
Total federal and state employment	362,000

The severe weather early in February caused a decrease in the total number of men employed directly in road building operations but a marked increase of employment is expected as soon as the weather improves.

3.2 Miles *of* Side-Hill Cut

Consolidated Engineering Co., Wheeling, W. Va., Had Unusual Experiences on Cut-Off near Moundsville, W. Va.

ROUND BOTTOM HILL on State Road 2 has long been a source of trial to motor trucks, motorists in general and to the State Road Commission of West Virginia. The hair-pin curves, steep grades and slides were constant causes for worry. In 1932 a contract was awarded to the Consolidated Engineering Co., of Wheeling, W. Va., for the grading of a cut-off along the base of the hill paralleling the right-of-way of the Baltimore & Ohio Railroad. The cut-off is shorter than the old road by ½ mile and eliminates four bad turns and a sharp ascending and descending grade. Work was started October 1, 1932, about one mile from the north end of the project with a 1-yard Osgood shovel loading to eight trucks. The subcontractor on the hauling, Bonar & Bonar of Cameron, W. Va., was paid at an agreed rate per yard and per station overhaul.

At the same time that the contractor started at the north end, another subcontractor, C. H. Rice & Sons of Belmont, Ohio, started excavating one mile north of the south end of the job with two Lorain 75 shovels loading to five trucks per shovel.

Disposal of Spoil a Problem

As the east side of the contract was a precipitous bank and the west side was the right-of-way of the railroad, the problem of disposal of the excavated material was a real one. The contract as let showed this condition very well. It was awarded September 23, 1932, for $95,206.52 and called for the excavation of 225,000 cubic yards of unclassified material at 34 cents per cubic yard, and 1,500,000 station yards of overhaul at 0.25 cents per station yard. The contractor had made arrangements to dispose of 100,000 yards of excavated material by casting at one point. It was planned to cast over the railroad tracks onto the river bank. An easement was secured from the railroad and a permit from the War Department. The casting began but very soon the toe of the bank began to slide and endanger the track of the main line of the railroad through this section so that it was necessary to haul all of this material a distance of 4,000 feet south to a dump, entailing the addition of 4,000,000 station yards of overhaul to the job.

There was one mile of straight cut at the south end through some bottomland, and a fill of 50,000 yards 10 to 15 feet high at the north end. Other material close to the north end was used to fill a swamp area owned by the Panama Mine.

Depth of Side-Hill Cuts

With the exception of the mile noted above, the entire job was all side-hill cut. The least bank encountered on the hillside was 45 feet high and this was removed in three lifts of 15 feet each. One 30-foot cut was made in one lift. This was at a point where the road had been graded and the bank slipped. The shovel ran through the cut on a rock ledge and handled the entire 30 feet at one time.

One Bad and Two Good Breaks

As the railroad paralleled the job the contractor shipped his shovel in by freight and had it unloaded direct to the grade from the main line track. That was a good break, as the bridge at the north end of the job was not strong enough to support the shovel. This fact also made it necessary to handle about 5,000 yards of sandy clay loam at the extreme north end of the job with a Universal crane mounted on a Brockway truck

and equipped with a ½-yard Williams clamshell bucket.

The bad break was due to the very heavy rains that were prevalent in this section early last spring. They made the going bad and the big shovel slid sideways into a mud hole and laid over on its side, sinking so that it was possible to walk from the grade onto the side of the shovel which was level with the grade. A good break occurred here, so that the shovel was put back on its feet, or crawlers, in record time. The Baltimore & Ohio had a wrecking crane going south over its line for some special work. It was held two hours at the reclining shovel and set it up, ready to be cleaned and restart its work. The wrecker then went on its way without holding up any of the Wheeling-Parkersburg-Huntington trains.

MAINTAINING THE GRADE AND THE DUMPS

As this was an emergency unemployment job, the use of bulldozers on the dumps was forbidden. The contractor was permitted to use bulldozers as graders to maintain the grade for the trucks. One Caterpillar Thirty pulled a Caterpillar grader with an 8-foot blade to maintain the road, and in other sections two Sixties with bulldozers were used for the same purpose. On the south end the subcontractor used a Caterpillar Sixty pulling an Athey crawler wagon of 6 yards capacity and for pulling a grader to maintain the road. He used two 10-ton Huber gas rollers and the contractor himself used a 10-ton Monarch steam roller on the north end to compact the grade where it had to be filled.

CULVERTS

Concrete pipe, corrugated metal and box culverts were specified on this contract. The concrete pipe culverts were 18, 24, and 30 inches in diameter and averaged 70 feet in length as they were run under the railroad track. This was done in open cut even though it was under main line track. A pair of 8 x 16-inch timbers 16 feet long were set under each rail with no posts. The hard granulated slag of the fill and ballast held up well and gave excellent support to the timbers well back from the open trench. Dipped corrugated culvert pipe from the Wheeling Metal & Mfg. Co., Glendale, W. Va., 18 and 24 inches in diameter, was also installed. There were two box culverts on the job, one 7 x 7 feet and the other 7 x 9 feet, each 60 feet long. These were extensions of existing B & O culverts. A Rex 7-S mixer was used to mix the concrete for the culverts with the aggregates weighed on a standard Fairbanks platform scale.

GASOLINE SUPPLY

The subcontractor who operated two large shovels used a 10,000-gallon gasoline tank mounted on a barge to maintain his supply of fuel. The gasoline was raised to the service or dispensing tanks on the grade by air pressure in the large tank on the barge. The Consolidated Engineering Co. had dispensing tanks at the north end of the job which were filled by the Standard Oil Co. of New Jersey tank truck each day.

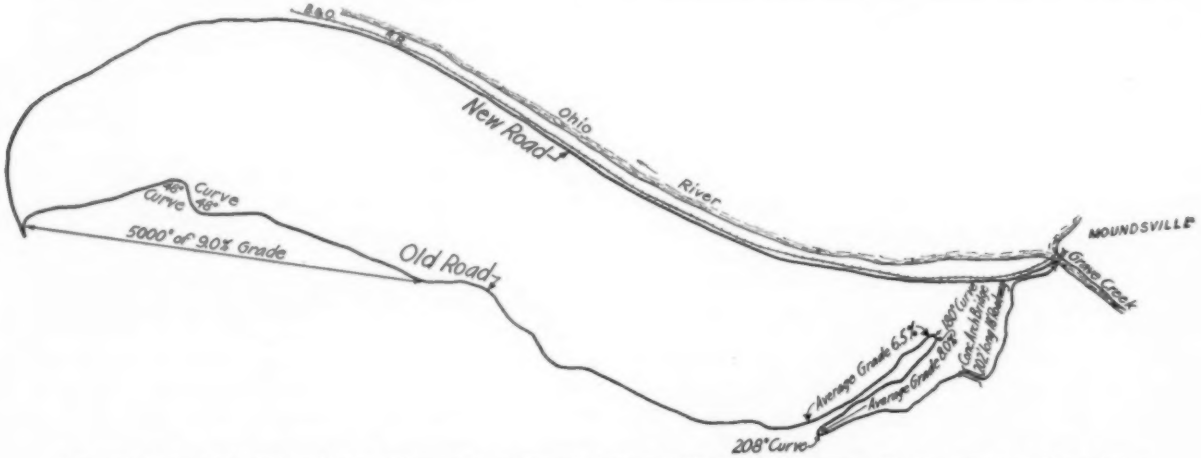
THE ENDEAVOR TO KEEP GOING

The contract date for the completion of the work was originally set for June 1, 1933, as the emergency funds were not available after the end of that month. Legislation then extended this date to January 1, 1934, and the increased amount of work on this particular project caused the State Roads Commission to extend the time limit to September 1, 1933. Because of the wet weather it had been possible to work only one week out of the month during the winter and up to June 1. If it had not been that the contractor spread his grade generously with "red dog," the burnt mine refuse seen around all coal mines in this district, he would not have been able to operate as well as he did.

PERSONNEL

W. O. McCluskey, Jr., was Superintendent for the Consolidated Engineering Co. of Wheeling, W. Va. For the State Roads Commission of West Virginia, J. M. McKinney was District Engineer, A. E. Harpold was Resident Engineer and H. L. Fish was Senior Inspector.

The prosperity of the country depends on good roads. Unless the construction of new roads continues, unemployment will be increased instead of decreased. Urge your Congressmen to vote for an appropriation for the continuation of Federal Aid highway construction.



A Comparison of the Old and New Alignments at Round Bottom Hill, Marshall County, W. Va., south of Moundsville

The Editor Comments

Personal Observations and Reflections

Federal Highway Aid Must Be Continued

The diversion of tax money derived by the States from highway users cannot be checked in any material degree in 44 states until the state legislatures convene in January, 1935. It is therefore vitally necessary that the Federal government continue its direction of and aid for state highway construction for 1934-35 in the same degree that it did in 1933-34. If the Federal government fails to meet this responsibility there will result an almost complete stagnation of road building throughout the country for the next twelve to fifteen months.

Representative Wilburn Cartwright of Oklahoma, Chairman of the House Committee on Roads, has introduced a bill in the House to appropriate another $400,000,000 for highway construction during the next fiscal year. Secretary Ickes, leader of the national emergency forces, and Thomas H. MacDonald, Chief, U. S. Bureau of Public Roads, agree on the need for a new emergency appropriation which will give continued employment to some half million workers, will assist to stabilize the heavy machinery industry which has only just begun to feel a renewed demand for new equipiment, and will carry on the great national program of highway construction which must not be permitted to falter, lest its momentum be lost.

Funds Available for Highways in 1934

According to replies from states to questionnaires issued by the American Road Builders' Association, the 48 states are planning an expenditure of $215,243,000 for construction in 1934, and $163,654,000 for maintenance, making a total of $378,897,000. This total compares unfavorably with the total of $587,172,578 in 1932 and $495,725,334 in 1933 expended by states and not including Federal funds. The total apportionment of PWA funds to states has amounted to $394,000,000 and, according to the report on January 1, 1934, there was a balance of $234,225,842 available for new contracts. This figure does not include the amounts of contracts under construction for which the unpaid balance as of January 1 was $143,700,000. This unpaid balance of $143,700,000 will be disbursed during 1934, and should be added to the total construction expenditure of $453,296,653 which is the estimated total funds available for construction, including both Federal and state money, for 1934.

The addition of this amount gives $596,996,653 as the estimated gross total construction expenditure for 1934. This compares with the average annual construction expenditure, both Federal and state, of $523,000,000 for the seven years of 1925-31 and with the peak construction expenditure of $731,000,000 in 1931. This means that 1934 highway construction will be 14 per cent above the yearly average for 1925-31 but only 81 per cent of the 1931 peak figure for highway construction.

The outlook for 1934, according to these figures, shows some improvement over 1933 when construction expenditures slumped to the estimated figure of $411,000,000. This improved outlook is due to the Federal appropriation carried over from last year as state funds for 1934 are off approximately $100,000,000 from 1933.

Spring Construction Opening Up

It seems safe now to say it *was* a hard winter in the same optimistic vein of the window cards which we have seen for the last three years, "Wow, That *was* a Depression." The hard winter has left its mark on our highway systems and has seriously delayed much of the preparatory work for 1934 construction. In many places frost has been so deep that even grading has been abandoned and as early as November 1 in northern New York State some projects were abandoned because of deep snow.

New England is just starting its road construction program with a few grading projects under way but more work is promised as the season grows older. Probably the most active sections of the country as far as construction is concerned today are the Pacific Coast with its bridges and dams and the Mississippi Valley where the Federal Government is now building a series of dams and locks to complete the links in the great chain for inland waterway navigation, from the head waters of the Mississippi to New Orleans. Construction has been active during most of the winter in the Mississippi Valley, due to well-planned plants in the design of which progressive contractors have taxed their ingenuity in making the best use of construction equipment.

Theodore Reed Kendall

How the Other Fellow Did It

Ideas That Have Already Proved Helpful to Contractors

Welding Service Saves Pile Driver

295. An expenditure of $385 for a new steam hammer cylinder was saved through the use of oxy-acetylene welding on a foundation job. The cylinder weighs 1,725 pounds and was repaired by bronze welding. The fracture was chipped out and carefully beveled, and then the cylinder was preheated just enough to take the chill off the casting before bronze-welding. It was unnecessary to build a regular preheating furnace around it, but it was covered with asbestos paper and an oil flame played on it until it had been sufficiently warmed up to go ahead with the work. About 20 pounds of all-purpose bronze-welding rod was necessary to complete the job. The cost of materials and labor for the work amounted to about $31. When the work was completed, and after the cylinder had been permitted to cool off slowly while carefully protected from any drafts of cold air, it was subjected to a test. While under 135 pounds per square inch steam pressure and a sustained pull of 45 tons, a 5-ton ram dropped its weight repeatedly on a base attached to the cylinder. This severe test afforded convincing proof that the bronze-welded repair was fully capable of withstanding the severe operating stresses. O-A-T 1.34

Platforms Aid Pouring of Bridge Deck

296. When pouring a slab or section of bridge deck, the use of platforms with legs which will reach to the bottom of the forms helps tremendously to get the concrete to all parts of the slab with equal facility. One bridge contractor uses 4 x 6-foot platforms with the legs built just right for each job. These platforms are set in the forms without interfering with the reinforcing and make a continuation of the wood tracks which he lays on the deck sections already poured. Protection with such a track is required by the specifications in most states for a certain period after pouring. This Georgia contractor uses 1 x 8-inch lumber in two tracks which adequately protects the concrete from the steel wheels of the concrete buggies. 25.6.26

A Bulk Cement Dock and a Warning Bell

297. In southern Minnesota we saw a cement dock with some novel points. The dock was built to handle two cars of cement at one time and was about 84 feet long. The runs from the cars to the central portion of the dock were about 5 feet wide. The section where the beam scales were located and where the dumping traps were set was about 25 feet wide and extended about the same distance from the cars toward the truck runway. The trucks backed under the traps, which were of wood with a wood back-stop against which the cement carts were dumped. Canvas was hung from the bottom of the traps so that it touched the aggregate batches in the 2-batch trucks to prevent loss of cement in dumping. There were four men for the cement car which was being unloaded, each with his own cement cart, and two men for the car which was just being opened up. At one side of the dumping dock there was a shed for the storage of cement in bags for culverts and other odd jobs. A bell was used to notify the truck drivers that the two batches of cement had been dumped and that he could pull out. This is a small detail but with the bell located at the level of the truck driver's seat, and sounded by pulling a cord from the top of the dock, the driver was immediately warned and there was no shouting back and forth which invariably ends in unpleasantness between the driver and the members of the cement dock crew. 25.5.16

Tool Boxes Galore

298. A Minnesota contractor, who is a firm believer in plenty of tool boxes with padlocks, carries a fair-sized box painted a neutral gray on the finishing machine to hold the greasing equipment for all the machines on the job. Thus, centrally located, it is ready for the greasers who work at night without getting out separate guns for the different machines. A rack on the paver carries all the odds and ends of dowels neatly packed away where they would not interfere with any workmen. There is also a large gray box which slides under the operator's platform like a drawer in which all the paver tools are kept and also the tools for the night men who handle the moving of water pipe and valves. The trailer pulled by the finishing machine and which carried the cutter for the center dummy joint was built unusually strong. This machine is loaded first on a large truck when moving equipment from one section to another and is strong enough to carry the entire set of bridges including the hand finishers bridges and the burlap bridge piled on to it to make one compact truck load. Forethought, tool boxes and proper lubrication will also make your job run better. 25.5.15

Curing Concrete with Sawdust

299. On a bridge contract in Georgia we found a contractor enthusiastic over the use of sawdust for curing concrete decks and the incidental concrete such as hand rails. He reported that sawdust holds the moisture for a longer time than any other cheap material available and the daily wetting down of the concrete curing material is greatly lessened. Remember this when you are running a concrete bridge job in the vicinity of a sawmill with a huge waste heap of sawdust. 25.6.26

A Straight-Edge from a 2 x 4

300. A contractor who preferred to make his own straight-edges for checking the concrete road slab took a 2 x 4 and planed it down so that it was 1¾ inches wide at the two edges and 4 inches deep with the handle suitably fixed to it. We found it proved very satisfactory and was quite resistant to warping. It was planed as needed several times a day after checking with a master straight-edge. 25.4.19

The Wisconsin Premoulded Expansion Joint Setter

301. A novel type of bulkhead used quite generally in Wisconsin for setting premoulded joints is worthy of description here. It is built up with a 3 x 3-inch angle iron shaped cold to the crown of the grade and with 4-inch plates riveted on and so spaced that they miss the dowels which run through the expansion joint material. The plates carry to the grade to support the joint material the full depth of the concrete and are bent to present a flat surface to the joint material. Along the top of the joint setter are several lugs projecting over the joint to prevent its riding high at any point. The vertical leg of the angle iron has a strip of 1½ x ¼-inch strap iron riveted on to hold the angle to the crown of the road. At intervals of about 3 feet, across the horizontal leg of the iron are eccentrics with handles fully 6 inches long and with the cams offset about 1 inch so that when the handle is turned it forces the cam against the premoulded joint and holds the material firmly in place when the setter is turned upside down and placed on the forms. The handles are pipes riveted on at each end. 25.5.31

Banks..Ditches..Subgrades

THIS GRADER HAS WHAT YOU NEED

IF you are working hard, tough soil . . . the No. 121 blade easily enters the meanest ground. If you want to cut high banks . . . the blade swings outward to cut as steep as 70 degrees and 8 to 9 feet high. If you want a wide reach outside the line of wheels . . . this 12-foot blade will reach out 6½ feet—9½ feet with blade extension—11 feet with Shoulder Finisher. If you want to shave subgrades to specifications . . . this machine has the weight and rigidity to hold the blade right where you want it. All adjustments are obtained quickly with little effort, through Adams mechanically-operated power-controls, featured above.

And—it's built to stand hard work; put it into rough, rocky country—its strong, welded construction will stand it. Machine-finished throughout, it's built for long life with adjustability for wear . . . Write for catalog describing this and other models of Adams Leaning Wheel Graders, furnished with 6½ to 12 ft. blades.

ADAMS
LEANING WHEEL
GRADER
No. 121

J. D. ADAMS COMPANY, Indianapolis, Indiana

Minneapolis . Kansas City . Omaha . St. Louis . Memphis
Atlanta . Dallas . Spokane . San Francisco

The Adams Line also includes: Motor Graders, Elevating Graders, Dump Trailers, Retread Machines, Road Maintainers, Rotary Scrapers, Road Rippers, Scarifiers, Fresnos, Drag Scrapers, Wheeled Scrapers, Plows, etc.

Construction Industry News

The Asphalt Institute, 801 Second Ave., New York City, has re-elected B. L. Boye of the Standard Oil Co. of New York, as its President. Other officers elected were: Vice Presidents, A. M. Maxwell, Standard Oil Co. of Ohio; Leroy M. Law, Shell Petroleum Corp.; J. A. Blood, Standard Oil Co. of California and T. M. Martin, Lion Oil Refining Co. of Arkansas. W. W. McFarland, President of the Warner-Quinlan Co. was re-elected Secretary and Herbert Spencer, Standard Oil Co. of New Jersey, was re-elected Treasurer. J. E. Pennybacker continues as Managing Director. Members joining The Asphalt Institute within the last year are: Ashland Refining Co., Ashland, Ky.; Lincoln Oil Refining Co., Robinson, Ill.; Lion Oil & Refining Co., Eldorado, Ark.; Macmillan Petroleum Corp., Eldorado, Ark.; Phillips Petroleum Corp., Bartlesville, Okla.; Pioneer Asphalt Co. of New York, New York City; Sinclair Refining Co. of Louisiana; Skelly Oil Co., Kansas City, Mo., and White Eagle Oil Co., Kansas City, Mo.

Link-Belt Co., Chicago, Ill., has announced the appointment of Wilbur G. Hudson as Chief Engineer of the Pershing Road Plant in Chicago. Mr. Hudson was associated with this company some time ago, after which he joined the Guarantee Construction Co. of New York as Vice President and later became President of the Wilbur G. Hudson Corp. Outside of his work in materials handling, Mr. Hudson has also been Vice President and Chief Engineer of the Curtiss-Wright Airport Corp., in charge of design and construction of airports.

Harnischfeger Corp., Milwaukee, Wis., has announced the appointment of Charles B. Foster to the position of Sales Manager of the entire line of P & H excavators, trenchers, backfillers and pipe line equipment. Mr. Foster has been associated with the company for some time, having served in the Export Department, Branch Manager of the Used Equipment Division, President of Excavating Equipment Dealers, and Assistant Sales Manager for excavators before assuming his present position.

United States Pipe & Foundry Co., Burlington, N. J., has recently opened offices in Room 608, Earle Bldg., Washington, D. C., in charge of S. E. Linderman, Washington Representative. Effective April 1 this company will also open offices in the Consolidated Gas Building, Boston, Mass., in charge of Carl N. Brown, formerly Kansas City Sales Agent. Mr. Brown will be succeeded at the Kansas City Office by R. C. Lemert, formerly of the Birmingham, Ala. Sales Office.

Patterson Foundry & Machine Co., East Liverpool, Ohio, has announced the opening of an office at Room 406, Basso Building, 7338 Woodward Ave., Detroit, Mich. Edwin L. Grimes is District Manager. Louis H. Burkhart, Jr., has been appointed to handle the territory in northern New York State and western Pennsylvania, and will make his headquarters at Corry, Pa.

Chain Belt Co., Milwaukee, Wis., has announced the appointment of the Intermountain Equipment Co. of Boise, Idaho, as the exclusive distributor in the Boise territory for the Rex line of construction equipment, including building mixers, pavers, central plant mixers, cold patch mixers, plaster and mortar mixers, a complete line of diaphragm and self-priming centrifugal pumps, and contractors' saw rigs.

Hercules Powder Co., Wilmington, Dela., has suffered the loss of its Assistant Treasurer, Fred F. Fenton, who died at his home in Wilmington on March 13, after a long illness. He was fifty-six years old. Mr. Fenton started his career in the engineering department of the Buffalo, Rochester and Pittsburgh Railroad, advancing to the position of Division Engineer. Shortly after the organization of the Aetna Explosives Co. in 1914, Mr. Fenton was made Secretary of this company, and later Secretary and Treasurer. In 1921, this company was acquired by Hercules and Mr. Fenton was appointed Assistant Secretary and Assistant Treasurer of the company in 1922.

Chevrolet Motor Co., Detroit, Mich., has announced the appointment of C. P. Fisken, formerly Promotion Manager, as Advertising Manager and his assistant, E. W. Timper, as Sales Promotion Manager. This announcement followed the resignation of R. H. Crooker as Advertising Manager. Mr. Crooker joins the Campbell-Ewald Co. as Vice President and Director supervising Chevrolet advertising.

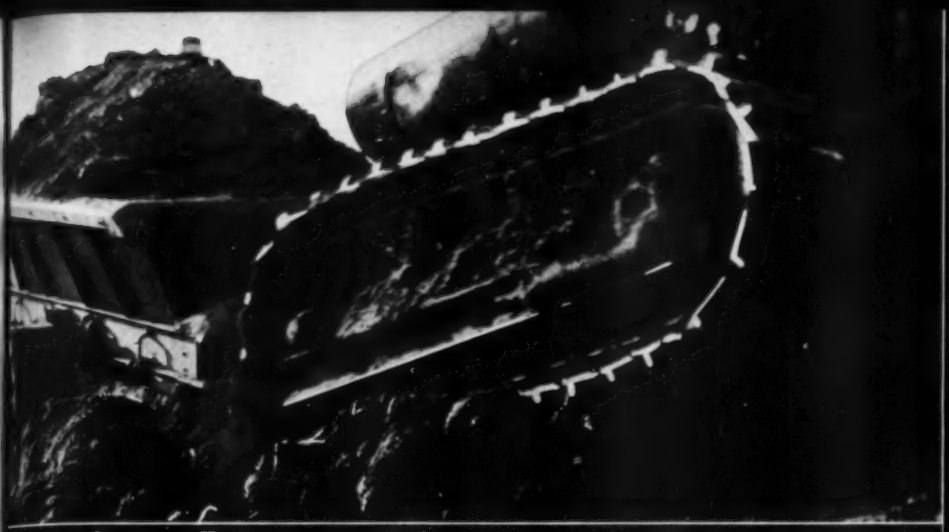
Administration of the Contractors' Code

WITH its membership officially approved by the N. R. A., the Divisional Code Authority for General Contractors, set up under Chapter II of the Code of Fair Competition for the Construction Industry, met in Washington to perfect arrangements for registering all contracts, enrolling all general contractors in the country and launching active administration of the code on March 19, its effective date. The meeting was called under the temporary chairmanship of A. E. Horst, public works contractor of Philadelphia, and a past president of the Associated General Contractors of America, which organization has been named in the code as the sponsoring trade association for administrative purposes.

Permanent officers of the Authority were announced as follows: A. E. Horst, Chairman; A. C. Tozzer, Turner Construction Co., New York, Vice Chairman; E. Marshall Rust, Rust Engineering Co., Pittsburgh, Treasurer; E. J. Harding, Managing Director, A. G. C. of A., Secretary; and Louis W. Hickey, Hickey & Co., Dallas, Texas, Executive Manager. In addition to the officers those appointed to the Authority are: for the heavy construction and railroad contractors, E. T. Foley, Foley Bros., Pasadena, Calif.; Nick F. Helmers, Siems-Helmers, Inc., St. Paul, President, A. G. C.; E. P. Palmer, Senior & Palmer, New York; and James B. Bray, W. W. Boxley & Co., Roanoke, Va.; for the building contractors, W. F. Austin, W. E. Wood Co., Detroit, Mich.; F. L. Shackelford, Potter & Shackelford, Inc., Greenville, S. C.; W. A. Klinger, William A. Klinger, Inc., Sioux City, Iowa; Robert A. Whidden, Whidden Co., Boston, Mass.; and William C. Miller, W. C. & A. N. Miller, Washington, D. C.; for the highway contractors, Robert E. O'Connor, J. C. O'Connor & Sons, Inc., Fort Wayne, Ind.; H. B. Zachary, H. B. Zachary Co., Laredo, Texas; L. E. Ray, Diamond Engineering Co., Grand Island, Neb.; Eugene P. Forrestel, Cold Spring Construction Co., Akron, N. Y.; and Charles H. Simpson, Municipal Paving & Construction Co., Nashville, Tenn.

Nick F. Helmers, A. E. Horst, A. C. Tozzer and Robert E. O'Connor are also members of the Code Authority for the Construction Industry which was called to meet in Washington on March 23 for the purpose of making nominations to the National Construction Planning and Adjustment Board, which is to be set up under the code to promote better relations between construction employers and employees. The Board will be composed of ten representatives of the employers, ten representatives of the employees and an impartial chairman to be appointed by the President.

Headquarters for the Divisional Code Authority for General Contractors have been established at the Munsey Building, Washington, D. C.



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Order from Your Dealer . . . He'll Make Immediate Delivery

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YOUR TRACTOR DEALER WILL TELL YOU . . .

YOU SAVE 10% to 50%

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because

D-A LUBRICANT

"Stays Put" and protects gears and bearings—goes twice as far, always uniform

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D-A MOTOR OIL

is specially refined for Tractors and Trucks from select 100% Pure Pennsylvania Crude—gives more hours of safe lubrication.

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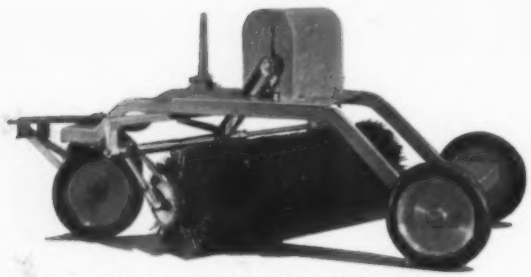


The Hough-Universal Road Sweeper

New Sweeper Prepares Road for Retread

A NEW sweeper unit mounted on four wheels with an independently-powered broom has been developed for road contractors and is especially designed for the sweeping requirements on retread black-top and oil-treated pavement contracts. This Hough-Universal road sweeper, made by the Frank G. Hough Co., 919 N. Michigan Ave., Chicago, Ill., does not have to be rigidly attached to another piece of equipment but can be hooked to or unhooked from a team or a truck or a tractor in a moment's time. Thus it does not tie-up the truck or tractor, which may be used for other work.

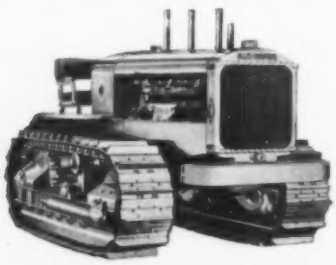
The sweeper with its independently-driven brush can be regulated to revolve at whatever speed best suits the sweeping condition at the particular time it is being used. On most sweepers the revolving speed of the brush is directly regulated by the ground speed of the vehicle on which it is mounted.

The broom is suspended from a substantial steel frame which in turn runs on four pneumatic tires. This gives the brush the same leveling motion as the blade on a grader. It is used particularly for spreading and thoroughly leveling gravel and aggregates on retread and road-mix paving jobs. The engine clutch is disengaged and the brush can be rolled over the loose aggregates. The overall width of the sweeper is 90 inches and the brush is 28 inches in diameter and 84 inches long, sweeping a swath 74 inches wide. It is powered with a Lauson 1-cylinder 4-cycle air-cooled 4-horsepower engine driving at a maximum speed of 75 rpm.

New Oil Tractors

TWO new tractors which are powered with a new type of oil engine operating on diesel fuel have been announced by the Allis-Chalmers Mfg. Co., Tractor Division, Milwaukee, Wis. These A-C oil tractors are built in two models, KO which develops 48 drawbar horsepower and weighs approximately 11,200 pounds, and Model LO which develops 76 drawbar horsepower and weighs approximately 23,000 pounds.

The engine which powers these tractors has no carburetor. A Bosch fuel pump of the open type injects the cold charge with cold air and ignites it with a spark. The compression pressure is the same as is customary in gasoline engines designed to use high test fuels, and herein lies the difference between this engine and the diesel. In this engine the compression pressure and the temperature are considerably below the self-ignition point of the fuels used, but an ordinary spark plug readily ignites the prepared fuel mixture and produces a smooth flow of power with pressures and temperatures in the cylinders no higher than exist in gasoline engines. The engine is easily started by a hand crank. A hand primer is supplied which sprays a small amount of gasoline into the intake manifold and the engine then starts like a gasoline engine.



One of the New A-C Oil Tractors

The A-C oil engine burns satisfactorily all fuels that are suitable for use in solid injection diesel engines of the type used in tractors and similar equipment. The same limitations as to viscosity, water, sediment and other qualities apply. Furnace oils and engine distillates of grades No. 2 and 3 are excellent fuels. The fuel consumption and cost of fuel vary but it is claimed that the A-C oil tractors will consume, on the average, about 70 per cent as much fuel as A-C gas tractors when doing the same work.

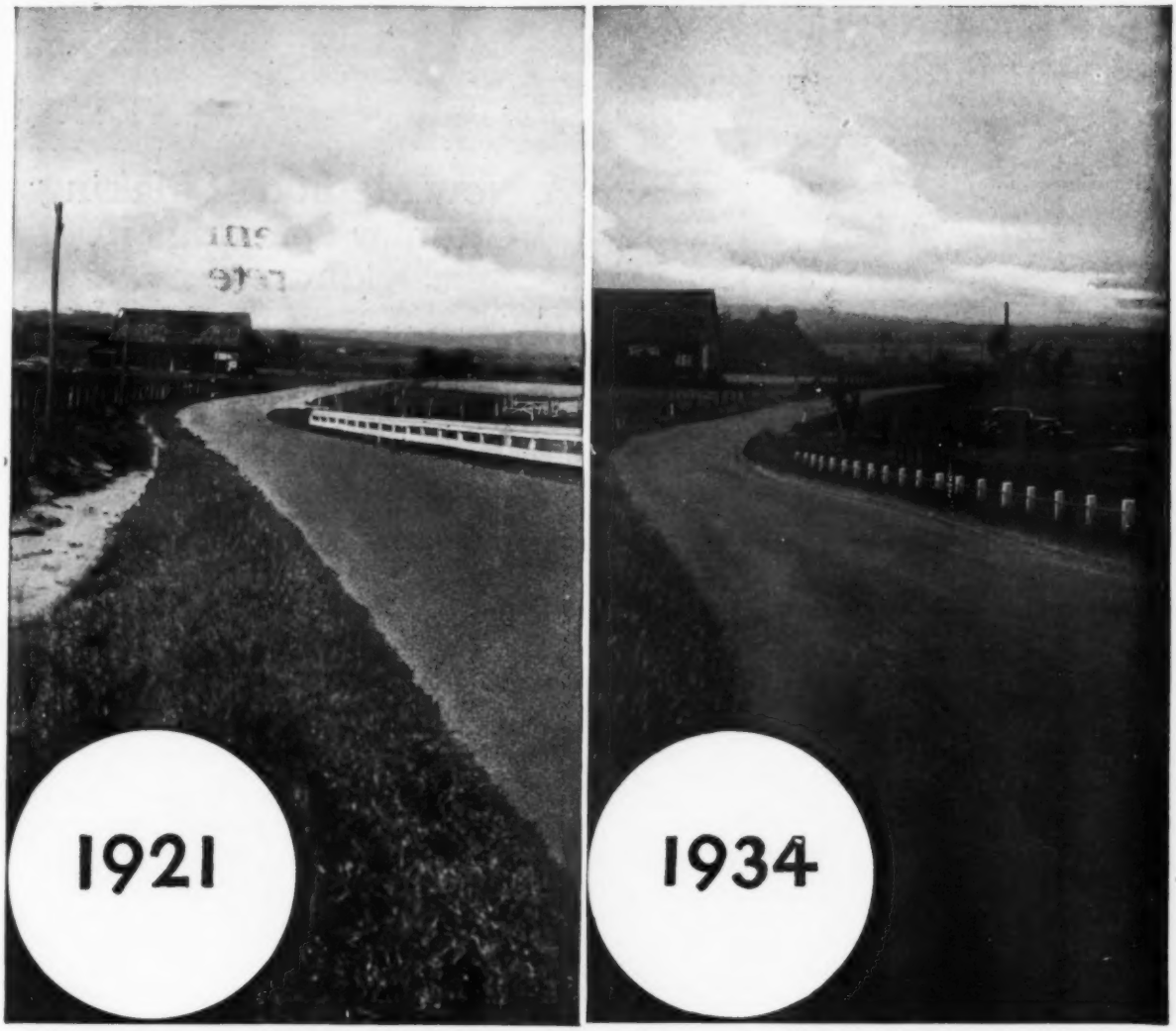
The mechanical features of the A-C gas tractors are retained in the new oil models, including unit construction, removable cylinders and inserted valve seats. The engines, as a whole, are interchangeable between gasoline and oil burning tractors.

An End-Post Assembly of the Tyton Highway Guard

An Easily-Repaired Highway Guard

A NEW guard rail, made of material selected on the basis of strength and long life, which may be easily erected and is economical in installation, has automatic adjustments which maintains the proper tension at all times and in which damaged sections can be easily repaired or replaced in any part of the rail, has been developed by the Toncan Culvert Manufacturers Association, Youngstown, Ohio. Tyton highway guard is mounted on posts of the conventional type of wood, concrete or metal. The posts are lined up in the usual way and then drilled to take the spring bolts. The heavy leaf springs of carbon steel are then mounted on the posts to support the panels. After all the springs are loosely bolted to the posts, the erection of the panels is easy. The end of one panel telescopes over the end of the next panel. Twelve heavy carriage bolts at each panel connection provide ample strength. The bolts passing through the spring are left loose until after the rail is in proper tension.

The front of the panel provides a smooth surface to guide the vehicle. The post at each end is anchored by the installation of a dead-man. The operation of tightening up the end springs brings the Tyton installation into proper tension when the tightening of the bolts passing through the springs at each panel connection completes the installation.

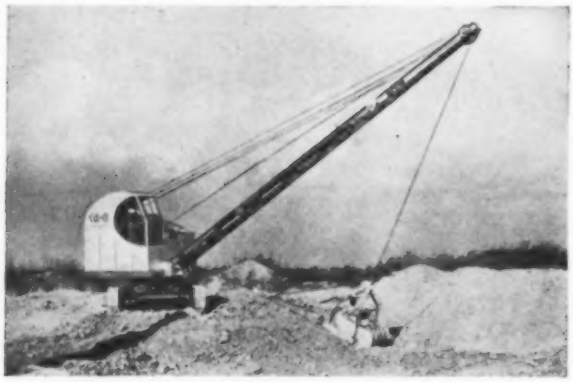


U. S. Highway No. 41, Marquette County, Michigan, Tarvia-built in 1921, while Woodrow Wilson occupied the White House. Photo at left was taken in 1924; photo at right shows present condition of the road.

TARVIA roads cost little to build, and require only the most inexpensive maintenance. They are easy-riding and skid-safe, and can be built to match any traffic load—at costs which assure maximum mileage of good roads from the road appropriation. Call in the Tarvia field man and give your road program the full advantage of The Barrett Company's thirty years of successful paving experience. 'Phone, write or wire our nearest office.

Barrett
Tarvia
GOOD ROADS AT LOW COST

THE BARRETT COMPANY New York Chicago Birmingham Philadelphia Minneapolis Boston Cleveland Detroit St. Louis Buffalo Lebanon Baltimore Providence Bethlehem Columbus Syracuse Rochester Youngstown Hartford Milwaukee Toledo Cincinnati Portland, Me. In Canada: THE BARRETT COMPANY, LTD. Montreal Toronto Winnipeg Vancouver



The New Bucyrus-Erie ⅜-yard Excavator

A New ⅜-Yard Excavator

THE new 10-B ⅜-yard excavator, recently announced by Bucyrus-Erie Co., South Milwaukee, Wis., is a fully and quickly convertible unit, offered with all types of front-end equipment for use as a shovel, dragline, crane, clamshell drag shovel, skimmer scoop, backfiller, or pile driver. Fully-revolving, the 10-B offers practical working ranges comparable with larger machines. The shovel with a standard boom at 45 degrees has a maximum cutting radius of 20 feet 3 inches, and a clear dumping height of 12 feet 6 inches. The crane rating at a 10-foot radius is 7,000 pounds. As a dragline and clamshell, a ⅜-yard bucket is easily handled on a 28-foot boom.

The unit weighs only 7½ to 8 tons, depending on the equipment used, an important feature for contractors who must move their equipment over highways. The light weight and compactness of this machine has been secured by using high-quality, heat-treated alloy steels with welded construction and simplified design. It is adaptable for use in close quarters, having a tail swing of only 5 to 7 inches. Speeds to 4¼ miles per hour are available and it steers accurately through friction clutches.

Other features of the 10-B are automatic lubrication, ball and roller bearings throughout, elimination of the center pintle by the hooked-roller swing-circle, a new type of boom construction, a new dipper and a power dipper trip.

How Air Filters Aid Your Equipment

A GASOLINE engine consumes approximately 8,400 gallons or 1,200 cubic feet of air for each gallon of gasoline consumed and, when operating at high speed, between 20,000 and 30,000 gallons of dust-laden air per hour must pass through the machine. Even in industrial cities there is 3.7 tons of dust pollution to the cubic mile of atmosphere and this is increased tremendously on dusty construction projects. This dust-laden air is drawn into the motor through the carburetor, mixed with the oil on the surfaces of the cylinder walls, piston, rings and valves, forming a resultant compound not unlike a good grinding-in formula. Not until it has done its damage is it washed into the crankcase by the oil.

Motor rings and pistons are fitted to cylinders with from 0.003 to 0.005-inch clearance and it is these fine clearances that make a new motor run on less gasoline and oil. How long a motor maintains its efficiency depends upon the filter protection it receives.

Most of the carbon forming in a motor is due to dirt entering with the air, the combustion flame fusing these particles into carbon. According to Air-Maze Corp., 311 Caxton Bldg., Cleveland, Ohio, records of no appreciable carbon up to and beyond 40,000 miles of motor truck operation are common in engines equipped with Air-Maze protective filters which keep the dirt out of the motor, extending the time between overhauling many thousands of miles. Air-Maze filters and breather protectors close to dirt the only two openings in a motor, and make oil changes less necessary. They keep expensive equipment on the highway earning profits and not in the shop spending profits on repairs.

A New Method of Making Circular Openings in Concrete

THE engineering and contracting professions have for years looked for ways and means of reducing form costs. Flexicore, a new flexible form for making circular openings from 1 to 24 inches in diameter in concrete not only reduces the form costs but enables the engineer and contractor to know exactly what that cost is in advance of construction. Patent claims for this method were granted late in 1933 and the device is now being marketed by the Flexicore Co., 200 Ellis-Singleton Bldg., Wichita, Kans. The form consists of a flexible rubber tube in which are embedded layers of cord which, due to their positioning, permit the core or form to expand diametrically about 30 per cent and at the same time shorten in length approximately 15 per cent when under air or water pressure.

This form is made in long lengths which may be coupled together and it is possible to construct monolithic openings of any desired length without joints. It is particularly adapted to the construction of telephone, telegraph, or power line conduits in buildings, in bridges, or underground, and also to the construction of sewers, culverts, drainage systems, irrigation projects, buildings, hollow piles, poles, or posts. It eliminates the use of special shapes for bends and turns, makes possible the construction of monolithic ducts or conduits, permits narrow and many times shallow trenches because workmen need not be in the trench during construction and it eliminates precast units and the consequent hauling and breakage costs.

The core is placed in the concrete without any coating whatever and yet, because of its diametrical contraction and longitudinal extension, when pressure is released, it detaches itself completely from the concrete and when removed is ready for immediate re-use. It is rented by the Flexicore Co. on a basis of linear feet of duct or opening constructed by this method. The core is equipped for either air or water at the contractors option and any contractor having ordinary concrete equipment has practically all equipment that is necessary to use this form.

One interesting development connected with the use of this form is jointless drain tile. The tile is cast with impervious concrete around the lower half of the form and with porous concrete over the top half. This porous concrete can be designed for ample strength and yet a 3-inch tile will permit water to enter at the rate of approximately 2,000 gallons per square foot per hour. This type of tile can be used for draining joints under pavement slabs. An all-porous tile can be used for many other forms of drainage.

A Flexicore in Use in the Construction of a 12-Inch Monolithic Concrete Drainage Duct. Note the Elongation of the Core and Its Positive Detachment from the Concrete.

"THE 'CATERPILLAR' DIESEL EXCELS ANYTHING I HAVE EVER SEEN" . .

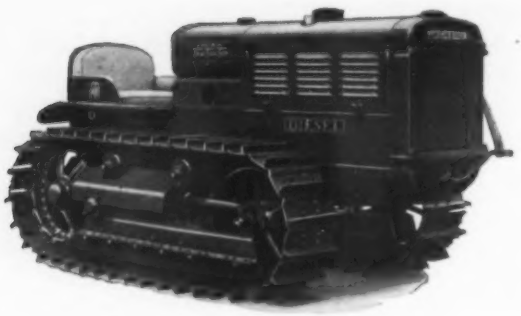
● SAYS THE COMMISSIONER OF HIGHWAYS OF AN ILLINOIS TOWNSHIP THAT HAD PREVIOUSLY OWNED THREE GASOLINE TRACTORS

The best judges of the "Caterpillar" Diesel Tractor — and the highest in its praise — are the purchasers who formerly owned gasoline tractors. They know by experience the tremendous savings from a tractor that burns low-price fuel, and less of it. They recognize the simplicity of the "Caterpillar" Diesel, and appreciate the advantage of a tractor that can be operated by the same men who formerly operated gasoline tractors. They have found in the "Caterpillar" Diesel a tractor that has big power, exceptional lugging ability, endurance. There are three sizes of "Caterpillar" Diesel Tractors — and engines available in stationary and portable power units. Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

This "Caterpillar" Diesel Fifty Tractor, equipped with bulldozer, is cutting the costs of filling in around culverts on a Long Island, New York, road-building job.

AMERICA GOES DIESEL

Polk County, Georgia, found how to build and maintain more miles of road for fewer taxpayers' dollars — with a "Caterpillar" Diesel Tractor and "Caterpillar" Grader.



The Diesel-Powered TracTracTor

A New Diesel-Powered Tractor

THE McCormick-Deering Model TD-40 TracTracTor, a ruggedly-built crawler tractor designed for heavy road building and maintenance jobs, bulldozing, operating trail builders, levee construction and similar work, is now available as a diesel-powered unit, according to a recent announcement from the International Harvester Co. of America, Inc., 606 So. Michigan Ave., Chicago, Ill. The diesel engine used in this unit is of the four-cylinder, four-stroke-cycle, valve-in-head type. The system of starting makes it possible for the operator to crank the engine as easily as a gasoline engine of corresponding size. To do this, a special device set by the operator but automatically disengaged is employed to reduce the compression pressure and place in operation a gasoline carburetor and magneto. Thus, in starting, the engine is operated like a gasoline engine until this automatic device cuts out and shuts off the connection, after which it operates on the regular diesel cycle.

Fuel to each cylinder is filtered five times and passes through two sediment traps. The fuel-injection nozzle for each cylinder is of the closed single-hole type. The maximum engine horsepower is 52, the maximum drawbar horsepower, 44. The injector pump, by-pass and injector nozzle are manufactured under controlled temperature and humidity conditions. The injector pumps are assembled as a unit with the governor, the starting release, and the two fuel-oil filters, and may be readily removed and replaced, thus obviating the necessity of field adjustments.

The engine operates at four controlled speeds of 1,100 rpm and under, and since the transmission provides five speeds the tractor may move at twenty different forward speeds. The five tractor forward speeds at full-load governed engine speed of 1,100 rpm are 1¾, 2¼, 2¾, 3¼ and 4 miles per hour. Reverse speed is 2¼ miles per hour.

The overall length of the tractor is 140 inches, the overall width, 63¾ inches, its drawbar heights, 17¾ inches, high, and 11 inches, low. The tractor readily turns within a circle of 7-foot radius, making it adaptable for work in restricted places.

A New Model Air-Cooled Engine

A NEW model has recently been added to the line of Doman-Marks engines manufactured by the Doman-Marks Engine Co., Amesbury, Mass. This new model, which is known as 6A-400, has a 4⅛-inch bore and 5-inch stroke and develops 111 horsepower at 2,600 rpm. This engine, like the other models of this line, is directly air-cooled, the advantages claimed for this principle being no leaky radiators, gaskets, water pumps or hose connections, no boiling, freezing or corrosion, and no care involving alcohol and other anti-freeze mixtures in cold weather.

Increasing the Life of Mixer-Drum Liners and Blades

THE Tennessee Valley Authority recently placed an order for three 3-yard Smith mixers with the T. L. Smith Co., Milwaukee, Wis. These mixers are to be used in constructing the new Norris Dam near Knoxville, Tenn. The mixers are of the same general type as the six 4-yard Smith mixers that has operated day and night at Boulder Dam, establishing new concrete-pouring records.

A feature of unusual interest is the method of increasing the life of the drum liners and blades. Instead of the usual removable steel liners, these mixers are equipped with full-width permanent steel liners and blades to which a wear-resisting coating has been electrically applied. The thickness of this coating varies, the greater thickness being applied where previous experience has shown that the greatest amount of wear takes place. The coating can be built up as required to compensate for wear, thus eliminating the usual delays and permitting almost continuous operation of the mixer. This type of lining greatly increases the life of the liners and the blades. The Boulder Dam mixers were lined with the same material and the results have been gratifying.

The Norris Dam mixers are of the latest type, roller bearing and ball bearing throughout, and are equipped with pneumatic tilt mechanism, a new fully-enclosed spur gear and multiple V-belt prime drive. The motor, mounted on the tilting frame, tilts with the drum. This method of driving requires less power and assures smooth, quiet running operation.

An Internal Vibrator for Concrete Placement

THE new Model V-53 spud vibrator, developed by the Syntron Co., 400 No. Lexington Ave., Pittsburgh, Pa., is particularly adaptable for use in floor slab construction and where there are thin walls of concrete. The vibrating spud is made by mounting a steel blade on the core and a handle on the armature. As the armature with the handle is considerably heavier than the core and blade, the inertia of this heavy mass maintains the handle practically stationary and the vibration is confined to the blade. The spud reaches down through the thin slab into the mass of concrete, vibrating the forms underneath as well as vibrating the reinforcing and the mass of concrete itself. It is also particularly adaptable for vibrating down around girders in floor construction as the thin, steel blade spud can easily go in between the beam and the form and thus reach points impossible of access by hand spading.

The New Model V-53 Spud Vibrator

This vibrator is made up with a simple electro magnet with no motors, cams, eccentrics, or bearings. When the magnet is supplied with pulsating current obtained by rectifying one half of the wave of alternating current by means of the Syntron patented controller, the gap between the core and the armature is closed and opened once for every cycle of the current. When operated on a 60-cycle, 110-volt alternating current, this gives 3,600 vibrations per minute. The net weight of the Model V-53 spud vibrator is 46 pounds.

LANSING 10-S MIXER

Here it is — in actual operation. Equipped with 12-hp. LeRoi, 4-cylinder gasoline engine, Alemite pressure lubrication, uses 13 heavy-duty Hyatt Bearings.

Partners in Performance

Two known and proved partners in performance are the Lansing 10-S Concrete Mixer and the Lansing F-25 New Concrete Barrow. This pneumatic-tire equipped barrow saves the handler many jars and jolts — producing better efficiency. Because of its easy, one-man handling, long life and long wearing qualities — the 10-S is always on the job, day after day. Better get complete information on these profit-builders. Write or wire.

F-25 BARROW

Tray capacity 5 cu. ft. (4 cu. ft. wet concrete, with Goodyear pneumatic tire and 16 in. x 4 in. wheel.

Chicago
New York
Boston
Minneapolis—San Francisco—Kansas City

LANSING-COMPANY • LANSING, MICHIGAN

A HANDY TRAILER MIXER

This 3½-cubic-foot Trailer Mixer may be loaded or discharged from either side, as it is fitted with an interchangeable lock. Ball bearing head with few wearing parts. It is easily and quickly moved from one job to the next because of its strong rubber-tired steel wheels (with 6-inch hubs). Power is furnished by a reliable 1¾-hp. engine.

Write for complete specifications

The J. B. Foote Foundry Co.
Fredericktown, O.

HANDIEST LEVEL MADE

Only **50c**

For both line and surface leveling. Also attaches to square by metal carrier for leveling or to serve as a plumb.

HALL'S OCTAGON LINE AND SURFACE LEVEL
(Patented Feb. 22, 1921)

Twin hooks prevent accidental detachment from line. Provided with metal box for carrying safely in tool box or pocket. The ideal level for mechanics, architects, home use, carpenters, building contractors, engineers, city and county surveyors, highway depts., etc. Aluminum, length 3 in., weight ½ oz. Ask your hardware dealer or order direct for any quantity.

Frank B. Hall Level & Mfg. Works Geneva, Ohio

HVASS

HVASS

BITUMINOUS DISTRIBUTORS
HEAVY-DUTY TRAILERS
SAND SPREADERS
CHIP SPREADERS
SWEEPERS
SPRINKLERS
HEATING KETTLES

Manufactured by

CHAS. HVASS & CO. Inc.
508 East 19th St. New York

"HVASS" Type 100-D Bituminous Distributor

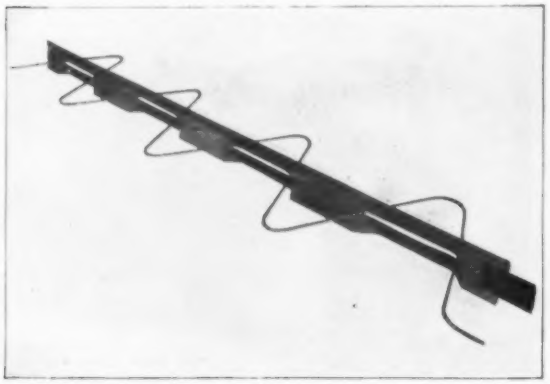
A Small Truck Equipped with a KBF Chain Drive Extension

Increasing the Capacities of Small Trucks

OPERATORS of 1½ and 2-ton trucks can now increase their gross weight pay load up to 22,000 pounds by means of a device recently announced by the Kay-Brunner Steel Products, Inc., P. O. Box 235, Los Angeles, Calif. The KBF chain drive extension, which will transform the small truck into a hauling unit equal in pay-load capacity to a truck costing much more, is claimed to give balance of weight, assure longer life for the tires, and provide flexibility, economical maintenance and more pulling power.

A New Closed Joint for Concrete Roads

A METAL-LACED joint, a new closed joint for concrete roads, has recently been announced by the A. O. Smith Corp., Milwaukee, Wis. The principle of design of this joint involves a vertical plate through which is threaded a zig-zag steel rod. No stakes or supports are required. The plate is shaped so as to provide an efficient slab interlock or transfer of the load vertically, while the zig-zag rod serves to lace the slabs together. The joint is mathematically proportioned to use every pound of metal in the most efficient manner. This joint furnishes a steel reinforcement of the slabs for 10 inches along adjoining sides.



The New Metal-Laced Road Joint

The Metal-Laced joint has few and simple parts which are easily and quickly assembled and handled. It is produced in standard 10-foot units, and designs are available for both longitudinal and transverse joints. A variety of rod diameters, plate widths and gages are offered, thus providing various combinations to meet all of the different highway requirements.

A New Scraper Excavator

A NEW slackline scraper excavator, which combines the most desirable features of a drag scraper and a slackline cableway, has recently been announced by Sauerman Bros., Inc., 464 So. Clinton St., Chicago, Ill.

The bucket furnished with this machine is the Sauerman Crescent scraper and is attached to a carrier which rides on a track cable. The method of operation resembles that of the standard drag scraper as far as digging and conveying are concerned, but in the dumping operation, the bucket is lifted into the air by tightening the track cable and the force of gravity is utilized to carry the empty bucket back to the digging point. This speeds up the operating cycle and results in a larger hourly handling capacity.

A Sauerman Slackline Scraper Digging and Hauling Gravel to the Crusher at a Large Sand and Gravel Plant

When used in the production of gravel, this Sauerman slackline scraper is operated from a stationary mast. For digging canals, building levees, and similar work, the machine is operated between a traveling head tower, from 80 to 130 feet in height, and a low tail tower. The largest of these units operates a 15-cubic yard bucket and has a rated capacity, on its average haul, of 500 cubic yards per hour.

Register Highway Contracts

BEGINNING March 19, 1934, highway contractors must register all new contracts of $2,000 or more entered into and pay a fee of one-tenth of one per cent of the contract price. This is required by the terms of the General Contractors Divisional Code which is binding upon highway contractors. Later Chapter II-C, which is now being formulated, will set up an administrative committee and rules and regulations to segregate highway contractors from other general contractors. This chapter will have no bearing on the registration of contractors and the collection of fees.

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